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UNDER THE SANCTION AND PATRONAGE OF

HIS ROYAL HIGHNESS PRINCE ALBERT,

Lord Warden of the Stannaries, Chief Steward of the Duchy of Cornwall and Devon, &c. &c.

2368

THE MINING ALMANACK

FOR 1849,

BEING A YEARLY COMPENDIUM

OF

INFORMATION ON GENERAL SCIENCE,

WITH

TABULAR AND OTHER STATISTICAL DETAILS

RELATING TO

The Mining Interests of Great Britain.

COMPILED AND ARRANGED BY

HENRY ENGLISH, MINING ENGINEER,

Editor of the "Mining Journal," &c. &c.

LONDON:

PUBLISHED AT THE MINING JOURNAL OFFICE, 26, FLEET STREET.

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TO

HIS ROYAL HIGHNESS PRINCE ALBERT,

LORD WARDEN OF THE STANNARIES,

Chief Steward of the Duchy of Cornwall and Devon, &c. &c.

MAY IT PLEASE YOUR ROYAL HIGHNESS,

IN respectfully dedicating the present volume of the MINING ALMANACK to your Royal Highness, permit me most gratefully to acknowledge the condescension afforded by your august sanction and patronage; while I sincerely trust the utility of the work, and the information collated, will be considered deserving the support with which it is so highly honoured.

The bright example thus set by your Royal Highness, in fostering science and upholding the interests of the mining community, cannot but be attended with beneficial results; while it will ever be gratifying to me to reflect on having

been the humble instrument of thus contributing towards the advancement of science as associated with mining enterprise.

This additional proof of the interest manifested by your Royal Highness in promoting mining operations cannot be too highly appreciated by the miner, as affording an assurance that the welfare of our home mines will be carefully watched over and protected.

I have the honour,
With every grateful feeling and respect,
To subscribe myself,
Your Royal Highness's
Most obedient, humble servant,
HENRY ENGLISH.

25, FLEET STREET,
April 16th, 1849.

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INTRODUCTION.

THE exalted patronage and the very liberal support received since the announcement of the present volume, as manifested in the lengthened list of subscribers which accompanies the work, is a source of twofold congratulation; first, as an evidence of the kindly feeling towards the compiler on the part of so many friends, and next, as a proof of the importance which is attached to a publication confined to mining enterprise.

The extent to which the work has been carried, although far exceeding that contemplated in the onset, will yet be found not sufficiently capacious to embody much useful and interesting matter, which must necessarily be reserved for the next year.

The object of the author, in compiling the present work, was that of rendering it one of reference as a record of proceedings connected with science associated with mining industry; and although, not having fully to his own satisfaction carried out the object in view, yet he trusts the arrangement made in the division of its contents will meet with general approval. It has been observed by many that the title does not sufficiently convey an idea of the importance of the subjects treated on, upwards of 300 pages being occupied by a series of original papers, treating on mineralogy, metallurgy, and practical mining, with the several reports of proceedings in the courts of law and equity, a *résumé* of the laws affecting the Stannaries Court, as well as Tin Bounds, and the collection of other important papers, including abstracts of Acts of Parliament bearing on mining, or the management of joint-stock companies; it is necessary, therefore, to state that the work has extended far beyond its original limits, and thus become rather a manual of science than a mere almanack.

The lists of the members of scientific bodies, which have been drawn up with extreme care and attention, including the names

of the several officers made up to the time of publication, present a novel feature, and will, we trust, meet the approval of the subscribers as well as the scientific world generally.

The statistical and tabular matter will speak for itself, embracing many original calculations, with a series of useful tables for reference ;—and here it may be well to offer our expressions of regret that such are not more perfect; as it will be seen, we have mainly confined ourselves to the produce of our copper-mines, and the imports and exports of ores and metals; not having been able to complete tables touching on the iron trade and collieries, as also other points, including tin and lead mines; these, however, will form an additional feature in our second volume, which we hope to have perfected at the close of the present year, giving a careful report of the proceedings of the several mining companies in the interval, and adding thereto such useful matter as may present itself. In the department devoted to the Almanack will be found many useful observations to the merchant and miner; while that of the directory, which closes the work, we have no hesitation in stating, is most perfect and complete, containing more information than conveyed in any similar publication, and as a work of reference, it is presumed will be estimated valuable in itself, without those important adjuncts to which we have previously directed the attention of our readers. In the "Miscellanea" are many interesting facts, treating on different subjects, thereby giving a variety to other points of interest and science. To the contributors of the original papers we have to express our obligations, among whom are several eminent gentlemen, whose talents are universally recognised by the scientific community at large ; while it is with regret we have been compelled to omit many interesting papers, from the late period at which they came to hand, or the length of the communications themselves,—to the writers of which, however, our thanks are no less due.

As forming a considerable bulk of the volume, we may refer to the papers on Mineral Topography, Mineralogy, and the Glossary, to the latter of which, in addition to the several terms used in the various home mining districts, those employed abroad have been added, thus rendering it perfect as a "dictionary" of mining terms,

the several meanings being given in a clear and intelligible form, and a distinction drawn between the meaning attached to certain terms in use, but which have a different application in the several districts. We have thus endeavoured to give a brief outline of the objects and utility of the work, which, from its nature, and the form in which it is published, may be consulted with advantage in the office or the mine, at the fireside or in the library, while it will, we trust, be found to form one of interest and reference to the man of science and of business.

It now only remains to convey to our numerous subscribers our most cordial thanks for the kind encouragement they have afforded, and to assure them that every exertion will be used to render the second of the series worthy their continued support; arrangements having been made for the appearance of the next at a much earlier period. Any suggestions will be most acceptable, it being the earnest desire to render the MINING ALMANACK worthy and deserving the support received. It is hardly necessary to observe, that the accomplishment of publishing a volume of so miscellaneous a character, although at the same time it may be said to be devoted to one subject alone, is a work of much time and difficulty, and will be best appreciated by those who may perchance have ever attempted such a task. It has been deemed unnecessary to give those minute details with reference to the working of mines, from the circumstance of the *Mining Journal* furnishing a weekly register or record. The success which has attended that publication over a period of fourteen years, being admitted as an authority, and consulted by all parties interested in mining pursuits, is the best evidence that could be afforded of the estimation in which it is held; while the present volume may be considered as a valuable adjunct, without in any way interfering with that publication.

In conclusion, we can only again express our thanks for the favours conferred and the confidence reposed.

THE EDITOR.

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1 East Wheal Crofty . . . Camborne.
1 East Wheal Rose . . . . Truro.
1 Ecton Mining Company. . . Offices, Manchester.

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1 Francis, Matthew, Capt. . . Aberrystwith.
1 Francis, Absalom, Capt. . . Halkin, near Holywell.
1 Francis, W., Capt. . . . Whitehall, Truro.
1 Fraser, W., Esq. . . . . 6, South Square, Gray's Inn.
1 Foote, W., Esq. . . . . Fetter Lane.
1 Fowey Consols . . . . Fowey.

1 Galvanized Iron Company . . 8, Mansion House Place.
1 Guest, Sir J. J., Bart., M.P. . 8, Spring Gardens.
1 Galloway, E., Esq., C.E. . . Southampton Buildings.

3 Gardiner, J. R., Esq. . . . Duchy of Cornwall Office.
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1 Goldsmid, Baron de . . . Regent's Park.
1 Gray, J., Esq. . . . . Wadebridge.
1 Great Polgooth Mine . . . 38, New Broad Street.
1 Greenhow, C. H., Esq. . . Plympton.
1 Graham, W., & Sons, Messrs. . Trig Lane, Upper Thames Street.
1 Grout, Joseph, Esq. . . . 12, Foster Lane, Cheapside, London.
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1 Galloway, W. & J., Messrs. . . Patent Rivet Works, Manchester.
1 Grylls, Glynn, Esq. . . . Helston.
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1 General Mining Company of Ireland Burgh Quay, Dublin.
1 Great Consols Mines . . . Gwennap.
1 Great Wheal Rough Tor . . 50, Threadneedle Street.
1 Grenfell & Sons, Messrs. . . 27, Upper Thames Street.
1 Gresham, Thos., Esq. . . . Raheny Park, and Dublin.

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1 Harrison, Ainslie, & Roper, Messrs. Ulverston.
1 Hartop, Henry, Esq. . . . Bamborough Hall, Rotherham.
1 Harvey & Co. . . . . Hayle Foundry.
1 Harvey, C. & W., Messrs. . St. Day, Cornwall.
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3 Henwood, J. W., Esq. . . . Manager of the Imperial Brazilian M.
1 Herbert, F., Esq. . . . 8, Heathcote Street, Mecklenburg Sq.
1 Hill, Frederick, Esq. . . . Helston.
1 Hitchens, Robert, Esq. . . . 28, Threadneedle Street.
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1 Hitchins, Jehu, Esq. . . . Tavistock.
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1 Harrison, George, Esq. . . 22, Hart Street, Bloomsbury Square.
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1 Irwill Foundry . . . . Salford.
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12 Johnson, P. N., Esq., F.R.S. . Hatton Garden.
1 Job, Capt. . . . . Alport Mines.
1 Johnson, H., Esq. . . . . Dudley.
1 Jossa, Major, Russian Consulate . 2, Winchester Buildings.

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1 Kennard, R. W., Esq. . . . 67, Upper Thames Street.
1 Kennedy, Charles S., Esq. . . Ulverston.
1 Kenworthy & Jones, Messrs. . . 51*a*, King William Street, Manchester.
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1 Kurnick, Capt. . . . . Ashburton.
1 Kingscote, Henry, Esq. . . . Abchurch Lane.
1 Kelly, Richard, Esq. . . . Royal Exchange Buildings.
1 Knipe, J. A., Esq. . . . Cambridge.

1 Law, James, Esq. . . . . Three Kings' Court, Lombard Street.
1 Lean, Capt. W. . . . . Holmbush Mines, Callington.
1 Lyle, Richard, Esq. . . . Carn Brea Mines.
1 Le Mesurier, Frederick, Esq. . 34, Great Winchester Street.
1 Lemon, Sir Charles, Bart., M.P. . 46, Charles Street, Berkeley Square.
1 Leighton, J. C., Esq. . . . Cwm Amman.
2 Lewis, G. M., Esq. . . . 6, Finsbury Square.
3 Lyle, Joseph, Esq. . . . Carn Brea Mines.
1 Lloyd & Cousin, Messrs. . . 18, Adam Street, Adelphi.
1 Lewis, W. T., Esq. . . . Pontypool, near Cardiff, Glamorgan.
1 Lloyd's Coffee House . . . Royal Exchange.
1 Lamerhooe Wheal Maria . . 4, King Street.
1 Lees, J., Esq. . . . . Manchester.

1 Mahoney, M. J., Esq. . . . 1, Newman's Court, Cornhill.
1 Mackillop, John, Esq. . . . Liverpool.
1 M'Intyre, —, Esq. . . . Temple.
1 Malen, Von du M. . . . Embassy.
1 Manby, C., Esq. . . . . 25, Great George Street, Westminster.
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3 Matthews, W., Esq. . . . Edgebaston, Birmingham.
1 Matthews, J., Esq. . . . Tavistock.
1 Miller, —, Esq. . . . . 117, Fenchurch Street.
1 Mitchell, R., Esq. . . . . 23, Hawley Road.
3 Montefiore, J., Esq. . . . Moorgate Street Chambers.
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1 Morris, T., Esq. . . . . Devon Great Consolidated Mines.
1 Morris, Charles, Esq. . . . Reform Club.
1 Morris, C., Esq. . . . . 7, Portugal Street.
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1 Mullins, J., Esq. . . . . Battersea.
1 Mullins, E., Esq. . . . . Great James Street, Bedford Row.
1 Munt, R., Esq. . . . . 40, Wood Street.
3 Muntz, G. F., Esq., M.P. . . Birmingham.
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1 Murray, T. L., Esq. . . . Cornhill.
1 Malens & Rawlinson, Messrs. . Millwall, Poplar.
3 Murray, A., jun., Esq. . . . Craven Street, Strand.
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1 Merrett, G., Esq. . . . . Warwick House, Regent Street.
1 Mansell, W. W., Esq. . . . 17, Dorchester Place, Blandford Sq.
1 Mount, G. W., Esq. . . . 1, St. Michael's Alley, Cornhill.

1 Moxon, John, Esq. . . . Regent's Park.
1 Michell, R. R., Esq. . . . West Wheal Providence, Marazion.
1 Mexican Mining Company . . Great Winchester Street.
1 Mark Valley Mines . . . Linkinghorne.
1 Mining Company of Ireland . . Lower Ormond Quay, Dublin.
1 Morewood & Rogers, Messrs. . Steel Yard, Upper Thames Street.
1 Marshall, George, Esq. . . 26, Bedford Street, Plymouth.
1 Mines Royal Company . . . Upper Thames Street.
1 Moyle, Jno., Capt. . . . East Birch Tor Mine, Devon.

1 New British Iron Company . . South-Sea House.
1 Northhouse, W. S., Esq. . . 20, Inverness Road, Bayswater.
1 Nugent, —, Esq. . . . Chichester Chambers, Chancery Lane.
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1 North Roskear Mine . . . Camborne
1 Northway, J., Esq. . . . Bedford Hotel, Tavistock.

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1 Pearce, —, Esq. . . . . Tavistock.
1 Pearse, W., Esq. . . . High Street, Exeter.
1 Perrin & Nolan, Messrs. . . Wicklow.
3 Pike, R. H., Esq. . . . . Carn Brea Mines, Cornwall.
1 Pirie, Sir John, Bart., Alderman . Birchin Lane.
1 Player, John, jun., Esq. . . Amman Iron-works, Llandilo.
1 Potts, Dr. . . . . 9, Buckingham Street, Strand.
1 Powles, J. D., Esq. . . . New Bank Buildings.
1 Pryor, F., Esq. . . . Bell Cottage, Redruth.
1 Payne, G., Esq. . . . . Newbury, Berks.
1 Palk, Robert, Esq. . . . Ashburton.
1 Pennant and Craigwen Mining Co. 57, Threadneedle Street.
1 Prosser, W., Esq. . . . . Old Jewry.
1 Penny, J. P., Esq. . . . Holt Hill, Birkenhead.
1 Passenger, R., Esq. . . . Union Street, Borough.
1 Pearson, C., Esq., M.P. . . . 10, Park Street, Westminster.
1 Patrick, H., Esq. . . . 12, St. Mary Abbotts Place, Kensington.

2 Reeves, Jas., Esq. . . . Leyton, Essex.
1 Rhydymerdy, Jno. Geo. . . Carmarthen.
1 Richards, Capt. W. . . . Redruth.
1 Rhymney Iron Company. . . 7, Lawrence Pountney Hill.
1 Richardson, Josh., F.G.S., M.I.C.E. Neath.
1 Richardson, C. S., Esq., C.E. . 5, White Friars Street.
1 Robins, Christopher, Esq. . . Landscove, Ashburton.
1 Robins, Samuel, Capt. . . Beam Mine.
1 Rowlandson, —, Esq. . . . 20, Greek Street, Liverpool.

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1 Rogers, J., Esq., F.G.S. . . Gwendræth, Carmarthen.
1 Royal Polytechnic Institution . Regent Street.
1 Royal Society . . . . Somerset House.
1 Royal Santiago Mining Company . Broad Street Buildings.

1 Silliman, B., M.D., LL.D. . . New Haven.
1 Sam, Sam's Son, Esq. . . Redruth.
1 Sabine, Colonel . . . . Woolwich.
1 Sandys, Carne, & Vivian, Messrs. . Copper House Foundry, Hayle.
1 Schneider & Co, Messrs. . . 10, Broad Street Mews.
1 Seccombe, Jas., Capt. . . . Mark Valley Mine.
1 Seccombe, Samuel, Capt. . . Phœnix Mines, Linkinghorne.
1 Shearman, W., Esq. . . . Stamp Office Buildings, Manchester.
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1 Sievier, J. R., Esq. . . . Polytechnic Institution.
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1 Snell, Wm., Esq. . . . . Gibson Square.
6 Sopwith, T., Esq., F.R.S. . . Allenheads, Haydon Bridge.
1 Sprague, J., Capt. . . . Tamar Silver Lead Mines.
1 Sprague, J., Capt. . . . . Tavistock.
1 Shears, J., & Sons, Messrs. . . 27, Bankside.
1 Square, J. Elliott, Esq. . . . Plymouth.
12 Stainsby, P., Esq. . . . 44, Finsbury Square.
1 Smithies, T. B., Esq. . . . Gutta Percha Co., Wharf Rd., City Rd.
1 Stalte, —, Esq. . . . . Trafalgar Square.
1 Stagg, W., Esq. . . . . Manchester.
3 Stephens, H. F., Capt. . . . Rose Cottage, Wadebridge.
1 Stewart, J., Esq. . . . . 22, Charing Cross.
1 Stewart, C., Esq. . . . . 22, Charing Cross.
3 Stokes, H. S., Esq. . . . Truro.
1 Simpson, W., Esq. . . . Bradmore House, Hammersmith.
1 Smith, Capt. W. H., R.N. . . Copthall Chambers.
1 Steggall, C. I., Esq., F.R.S. . Weymouth.
1 Sexton, J., Esq., C.E. . . . London.
1 St. John del Rey Mining Company . 6, Tokenhouse Yard.
1 Stride, James, Esq. . . . . 27, Spring Gardens.
1 Struvé, W. Price, Esq., C.E. . Swansea.
1 Statistical Society . . . 12, St. James's Square.

1 Tabb, John, Capt. . . . Lamerhooe Mine, Callington.
1 Taunton, T. H., Esq. . . . 24, Sloane Street.
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1 Taylor, Richard, Esq. . . . Falmouth.
1 Taylor, H. L., Esq. . . . Queen Street.
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1 Town & Rawlinson, Messrs. . . Ulverston.
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1 Tregonning, A., Esq. . . . Walthamstow Copper Mills.
3 Tredinnick, R., Esq. . . . Three Kings' Court, Lombard Street.
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1 Trestrail, John, Esq. . . . Southampton.
1 Truscott, Jas., Esq. . . . Swan Chambers.
1 Tresevean Mining Company . . Bond Court, Walbrook.
1 Treviskey and Barrier Mine . . Scorrier, Truro.
1 Taylor, C., Esq. . . . Manchester.
1 Todd, Col. . . . . Pendennis Castle, Falmouth.
1 Tapperell . . . . East Birch Tor Mines, Devon.

1 United Mines . . . . Duke Street, Adelphi.
2 United Mexican . . . . 5, Finsbury Crescent.

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3 Verran, Capt. W. . . . Devoran, Cornwall.
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1 Vivian & Sons, Messrs. . . . Paul's Wharf, 25, Upper Thames St.

1 Watson & Cuell, Messrs. . . 1, St. Michael's Alley, Cornhill.
1 Watson, J. Y., Esq. . . . St. Michael's Alley, Cornhill.
1 Watson, Thos., Esq. . . . 12, Cornhill.
1 Webb, T., Esq. . . . Llanelly.
1 Weekes, Walter, Esq. . . . Wunwood, Tavistock.
1 West, W., Esq. . . . . St. Blazey, Cornwall.
1 Wilkins, W., Esq. . . . Millwall, Poplar.
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1 Williams, Hiram, Esq., C.E. . . Moorgate Street.
1 Williams, W., Esq. . . . Swansea.
1 Williams, Michael, Esq. . . . Trevince, Cornwall.
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1 Williams, John, Capt. . . . Ecton Mine, Staffordshire.
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1	Wilson, Glendinning, Miss	Victoria Cottage, Holloway.
6	Woodhouse, Jno., Esq.	Overseal, Ashby de la Zouch.
6	Wyld, Jas., Esq., M.P.	Charing Cross East.
1	Williams, Thos., Esq.	St. John's Town, Carmarthen.
2	Wishaw, F., Esq., C.E.	9, John Street, Adelphi.
1	Wolferstan, James, Esq.	Beeralston, Devon.
1	West Buller Mine	Redruth.
1	West Seton Mine	t. Day.
1	West United Hills Mine	Truro.
1	West Wheal Jewel Mine	Old Broad Street.
1	West Wheal Treasury Mine	Camborne.
1	Wicklow Copper Mines	Vale of Ovoca, co. Wicklow.
3	Wheal Anderton Mine	Tavistock.
1	Wheal Seton Mine	Falmouth.
1	Walls, T. W., Esq.	Lambeth Terrace.
1	Willink, Daniel, Esq.	Liverpool.
2	Young, J., Esq.	Lloyd's.

Mining Almanack.

1849.

PART I.

		Memoranda.
1.	M.	
2.	T.	
3.	W.	
4.	Th.	
5.	F.	
6.	S.	
7.	S.	
8.	M.	
9.	T.	
10.	W.	
11.	Th.	
12.	F.	
13.	S.	
14.	S.	
15.	M.	
16.	T.	
17.	W.	
18.	Th.	
19.	F.	
20.	S.	
21.	S.	
22.	M.	
23.	T.	
24.	W.	
25.	Th.	
26.	F.	
27.	S.	
28.	S.	
29.	M.	
30.	T.	
31.	W.	

The Greek year was divided into 12 lunar months of 29 days 13 hours each. Solon established that the Athenian months should be reckoned at 29 days and 30 days alternately. Thus arose a regular lunar year of 354 days, and in order to make this agree with the solar year, a month was intercalated every other year. Gamelion, a month of 30 days and the 7th of the Attic year.

Anniversaries, Meetings, &c.

1. M. Circumcision. Union of Gt. Britain and Ireland, 1801.
2. T. County Sessions at Bodmin.
3. W. Sampling at Devon Consols.
4. Th. Copper Ticketing at Redruth, N. Roskear, N. Pool, &c.
5. F. East Pool pay day. Dividends due.
6. S. Epiphany. Twelfth day. West Jewel pay day.
7. ℣. First Sunday after Epiphany.
8. M. County Court at Helston. Fire Insurance expires.
9. T. County Court at Penzance.
10. W. Consols and United Mines Sampling. Penny Post, 1840. Royal Exchange burnt, 1838.
11. Th. Copper Ticketing at Redruth. Hilary Term begins.
12. F. County Court at Redruth.
13. S. County Court at St. Columb. Cambridge Term begins.
14. ℣. Second Sunday after Epiphany.
15. M. Queen Elizabeth crowned, 1599. Cotton first imported into Liverpool, 1785. Oxford Term begins. Library British Museum founded, 1823.
16. T.
17. W. Consols account at the Mine. Wheal Seton Sampling. Franklin born, 1706.
18. Th. Old Twelfth Day. Copper Ticketing at Truro. Devon Consols, &c.
19. F. James Watt born, 1736. Copernicus, 1473. American Independence, 1783.
20. S. St. Fabian. First English Parliament, 1269.
21. ℣. Third Sunday after Epiphany. Saint Agnes. Louis XVI. beheaded, 1790.
22. M. St. Vincent. Treviskey and Barrier ac. day. Bacon b. 1561.
23. T.
24. W. Devon Consols account day. Carn Brea Sampling. Pitt died, 1806. Frederick the Great born, 1688.
25. Th. Copper Ticketing at Truro. Consols United Mines, &c.
26. F. Brazil discovered, 1496.
27. S.
28. ℣. Fourth Sunday after Epiphany. Defeat of Sikhs at Aliwal.
29. M. King George III. died, 1820.
30. T. Tresavean account at the Mine. Charles I. beheaded, 1648.
31. W. No Copper Sampling this week. Hilary Term ends.

		Memoranda.
1.	Th.	
2.	F.	
3.	S.	
4.	S.	
5.	M.	
6.	T.	
7.	W.	
8.	Th.	
9.	F.	
10.	S.	
11.	S.	
12.	M.	
13.	T.	
14.	W.	
15.	Th.	
16.	F.	
17.	S.	
18.	S.	
19.	M.	
20.	T.	
21.	W.	
22.	Th.	
23.	F.	
24.	S.	
25.	S.	
26.	M.	
27.	T.	
28.	W.	

Greek Calendar.—Anthesterion, the 8th month, and of 29 days: so called from Anthesteria, a feast in honour of Bacchus, in which it is probable flowers were profusely used, as the word appears to be derived from *anthos*, a flower.

Anniversaries, Meetings, &c.

1. Th. Copper Ticketing at Redruth. Wheal Seton, &c.
2. F. East Pool pay day. Candlemas day.
3. S. West Jewel pay day. St. Blazey. John of Gaunt died, 1399. Monte Video taken, 1807.
4. ☩. Septuagesima Sunday. Cato died, B.C. 46.
5. M. Agatha. Budnick account at the Mine.
6. T. South Wheal Bassett account at the Mine. Charles II. died, 1685.
7. W. Wheal Mary account at the Mine. Devon Consols Sampling.
8. Th. Copper Ticketing at Redruth, Carn Brea, &c. Mary Queen of Scots beheaded, 1587.
9. F. Bank of England established, 1691. New Corn Bill introduced.
10. S. Queen Victoria married, 1840.
11. ☩. Sexagesima Sunday. University College established, 1826.
12. M. Lady Jane Grey beheaded, 1554. Seton account at the Mine.
13. T. Revolution, 1688.
14. W. St. Valentine. Old Candlemas day. United Mines Sampling.
15. Th. No sale of Copper Ore this week. National debt com. 1500.
16. F. County Court at Redruth.
17. S. County Court at St. Columb.
18. ☩. Quinquagesima Sunday. Shrove Sunday.
19. M. Galileo born, 1564.
20. T. Shrove Tuesday. East Pool account at the Mine.
21. W. Ash Wednesday. Seton Sampling. Cranmer burnt, 1566.
22. Th. Copper Ticketing at Andrews' Hotel. Devon Consols, &c. Annular eclipse—Sun invisible.
23. F. Sir Joshua Reynolds died, 1792.
24. S. St. Matthias. Duke of Cambridge born, 1774. Revolution in Paris, 1848.
25. ☩. Quadragesima Sunday. First Sunday in Lent.
26. M. Napoleon left Elba, 1815.
27. T. North Pool account at the Mine. Sir C. Wren died, 1723.
28. W. Ember week. Carn Brea, &c. Sampling.

		Memoranda.
1.	Th.	
2.	F.	
3.	S.	
4.	S.	
5.	M.	
6.	T.	
7.	W.	
8.	Th.	
9.	F.	
10.	S.	
11.	S.	
12.	M.	
13.	T.	
14.	W.	
15.	Th.	
16.	F.	
17.	S.	
18.	S.	
19.	M.	
20.	T.	
21.	W.	
22.	Th.	
23.	F.	
24.	S.	
25.	S.	
26.	M.	
27.	T.	
28.	W.	
29.	Th.	
30.	F.	
31.	S.	

Greek Calendar.—Elaphebolion, the 9th month of the Athenian year, of 30 days: so called from a festival in honour of Diana, surnamed Elaphebolos, the huntress, a word derived from *ballo*, to hurl or shoot at, and *elaphos*, a stag.

Anniversaries, Meetings, &c.

1. Th. Copper Ticketing at Farquharson's Hotel, Truro. United Mines, &c.
2. F. East Pool pay day. John Wesley died, 1791.
3. S. West Jewel pay day.
4. ℣. Second Sunday in Lent.
5. M. Corregio died, 1534. La Place died, 1827.
6. T. Dr. Parr died, 1825. Michael Angelo born, 1475.
7. W. Devon Consols Sampling. Bank of England suspended payment, 1790.
8. Th. Copper Ticketing at White's Hotel, Pool. Wheal Seton, &c. Partial eclipse of the Moon visible.
9. F. Full Moon. First issue of £1 notes, 1797.
10. S. Pinkerton died, 1825. Benj. West, Pres. of the R. Academy, died, 1820. Playfair born, 1749.
11. ℣. Third Sunday in Lent.
12. M. St. Gregory. Battle of the Boyne, 1689. Chelsea Hospital founded, 1682.
13. T. Georgium Sidus discovered, 1781.
14. W. Consols and United Samplings.
15. Th. Copper Ticketing at Redruth. Carn Brea, &c. London Bridge com. 1824.
16. F. Gustavus Third assassinated, 1792.
17. S. St. Patrick's Day.
18. ℣. Fourth Sunday in Lent. Princess Louisa Caroline born, 1848.
19. M. Treviskey and Barrier account. Le Brun born, 1739.
20. T. Spring begins. Sir Isaac Newton died, 1727.
21. W. Benedict. Devon Consols and Great Consols accounts. North Pool and Seton Sampling.
22. Th. Copper Ticketing at Pearce's Hotel, Truro. Devon Consols, &c.
23. F. National Gallery founded, 1824.
24. S. New Moon. Chesterfield died, 1773.
25. ℣. Fifth Sunday in Lent. Lady Day.
26. M. Prince George of Cambridge born, 1819.
27. T. Tresavean account at the Mine. Peace of Amiens, 1802.
28. W. Carn Brea Sampling. Gunpowder first used in Europe, 1380.
29. Th. Copper Ticketing at Truro. Consols. United, &c. Test Act passed, 1678.
30. F. Cambridge Lent Term ends.
31. S. Oxford Lent Term ends.

		Memoranda.
1.	S.	
2.	M.	
3.	T.	
4.	W.	
5.	Th.	
6.	F.	
7.	S.	
8.	S.	
9.	M.	
10.	T.	
11.	W.	
12.	Th.	
13.	F.	
14.	S.	
15.	S.	
16.	M.	
17.	T.	
18.	W.	
19.	Th.	
20.	F.	
21.	S.	
22.	S.	
23.	M.	
24.	T.	
25.	W.	
26.	Th.	
27.	F.	
28.	S.	
29.	S.	
30.	M.	

Greek Calendar.—Munychion, the 10th month of the Greeks, including 29 days: so called in honour of Diana, surnamed Mynychia, from the part of Piræus called Mynychia, where that goddess had a temple which was a sanctuary for fugitives, and whose annual solemnities were held at Athens on the 6th of the month.

Anniversaries, Meetings, &c.

1. S. Palm Sunday.
2. M. Budnick account at the Mine.
3. T. South Bassett account at the Mine. Napier died, 1617. Battle of Copenhagen, 1801.
4. W. Ambrose. Devon Consols Sampling.
5. Th. Maundy Thursday. Copper Ticketing at White's Hotel, Pool. North Pool. Seton, &c.
6. F. Good Friday. East Pool pay day. Old Lady day.
7. S. Full Moon. West Jewel pay day.
8. S. Easter Sunday. Money first coined B.C. 869. Fire Insurance expires.
9. M. Easter Monday.
10. T. Wheal Seton account at the Mine. Catholic Emancipation Bill passed, 1829.
11. W. Wheal Mary account at the Mine. United Mines Sampling.
12. Th. Copper Ticketing at Andrews' Hotel. Carn Brea, &c. America discovered, 1492.
13. F.
14. S. Otway died, 1685. Handel died, 1759.
15. S. Low Sunday. Easter Term begins.
16. M.
17. T. East Pool account at the Mine. Dr. Franklin died, 1790.
18. W. Consols. Seton, &c. Sampling. American revolution, 1775.
19. Th. Copper Ticketing at Redruth. Devon Consols, &c. Lord Byron died, 1824.
20. F. Spanish Armada defeated, 1657.
21. S. Heber born, 1783. Duke of Sussex died, 1843.
22. S. Second Sunday after Easter. Cromwell deposed, 1659.
23. M. St. George's Day. Shakespeare born, 1564, died, 1616.
24. T. North Pool account at the Mine.
25. W. St. Mark's Day. Princess Alice born, 1843. Carn Brea Sampling.
26. Th. Copper Ticketing at Redruth. United. S. Caradon, &c.
27. F.
28. S. Mutiny of the Bounty, 1789.
29. S. Third Sunday after Easter.
30. M. War with France, 1803. London University commenced, 1827.

		Memoranda.
1.	T.	
2.	W.	
3.	Th.	
4.	F.	
5.	S.	
6.	S.	
7.	M.	
8.	T.	
9.	W.	
10.	Th.	
11.	F.	
12.	S.	
13.	S.	
14.	M.	
15.	T.	
16.	W.	
17.	Th.	
18.	F.	
19.	S.	
20.	S.	
21.	M.	
22.	T.	
23.	W.	
24.	Th.	
25.	F.	
26.	S.	
27.	S.	
28.	M.	
29.	T.	
30.	W.	
31.	Th.	

Greek Calendar.—Targhelion is the 11th month of the Greeks, and includes 30 days. On the 6th and 7th days of this month, an Athenian festival in honour of the Sun and his attendants, the hours, was celebrated, at which the first-fruits were borne in procession, and called Targhelia, whence the name of the month.

Anniversaries, Meetings, &c.

1. T. Duke of Wellington born, 1769. England and Scotland united, 1707.
2. W. Devon Consols Sampling.
3. Th. Copper Ore Ticketing at Tyack's Hotel, Camborne. Consols. Wheal Seton, &c.
4. F. East Pool pay day. Seringapatam taken, 1799.
5. S. St. John. West Jewel pay day. Napoleon died, 1821.
6. ✠. Fourth Sunday after Easter. Full Moon.
7. M.
8. T. Easter Law Term ends.
9. W. Consols and United Mines Sampling. Louis XV. died, 1774.
10. Th. Copper Ore Ticketing at Andrews' Hotel. Carn Brea, &c. Battle of Lodi, 1796.
11. F. Earl of Chatham died, 1778.
12. S. Earl of Strafford beheaded, 1641.
13. ✠. Rogation Sunday.
14. M. West Jewel Annual Meeting at the Offices.
15. T. Cuvier died, 1832.
16. W. Great Consols account at the Mine. Seton and North Roskear Sampling. Corn Bill passed, 1846.
17. Th. Ascension. Copper Ore Ticketing at Pearce's Hotel, Truro. Devon Consols.
18. F.
19. S. St. Dunstan. Anne Boleyn beheaded, 1536.
20. ✠. Sunday after Ascension. York Minster burnt, 1840.
21. M. Treviskey and Barrier account. First Railway Act passed, 1801.
22. T. Trinity Law Term begins.
23. W. Devon Consols account. Carn Brea Sampling. Battle of Ramillies, 1706.
24. Th. Queen Victoria born, 1819. Copper Ore Ticketing at Pearce's, Truro. Consols, United, &c.
25. F. Princess Helena born, 1846. Dr. Paley died, 1805.
26. S. Oxford Easter Term begins.
27. ✠. Whit Sunday. Pentecost.
28. M. Whit Monday. William Pitt born, 1759.
29. T. Tresavean account at the Mine. Charles II. restored.
30. W. Ember week. No Copper Ore Sampling this week. Oxford Term begins.
31. Th. Copper Ore Ticketing at Tyack's Hotel, Camborne. Wheal Seton, North Roskear, &c.

		Memoranda.
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5.	T.	
6.	W.	
7.	Th.	
8.	F.	
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10.	☉.	
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12.	T.	
13.	W.	
14.	Th.	
15.	F.	
16.	S.	
17.	☉.	
18.	M.	
19.	T.	
20.	W.	
21.	Th.	
22.	F.	
23.	S.	
24.	☉.	
25.	M.	
26.	T.	
27.	W.	
28.	Th.	
29.	F.	
30.	S.	

Greek Calendar.—Scirophorion, the 12th month, with 29 days, on the 12th of which an annual solemnity was held in honour of Minerva. The derivation of the name is uncertain, but most probably from Scirus, a borough where there was a temple dedicated to that goddess, and surnamed Minerva Scirus from that circumstance.

Anniversaries, Meetings, &c.

1. F. Nicomede. East Pool pay day. Lord Howe's victory, 1794.
2. S. West Jewel pay day. Riots in London, 1780.
3. S. TRINITY SUNDAY. Peace signed at Paris, 1814.
4. M. Budnick account at the Mine. King George III. born, 1738.
5. T. South Bassett account at the Mine. King of Hanover born, 1771.
6. W. Devon Consols Sampling. Lord Anson died, 1762.
7. Th. Copper Ore Ticketing at Redruth. Carn Brea, &c. Royal Exchange founded, 1566. Reform Bill passed, 1832.
8. F. Bishops sent to the Tower, 1688.
9. S. Edward the Black Prince died, 1376. Liverpool Old Dock made, 1699.
10. S. FIRST SUNDAY AFTER TRINITY.
11. M. St. Barnabas. Seton account at the Mine.
12. T. Trinity Law Term ends. Wat Tyler killed, 1381.
13. W. Wheal Mary account at the Mine. United Mines Sampling. Last quarter.
14. Th. No Ticketing this week. Battle of Marengo, 1800.
15. F. Magna Charta signed, 1215. First stone of New London Bridge laid, 1825.
16. S. Duke of Marlborough died, 1722.
17. S. SECOND SUNDAY AFTER TRINITY.
18. M. Battle of Waterloo, 1815. Waterloo Bridge opened, 1817.
19. T. East Pool account.
20. W. Queen Victoria's accession, 1837. North Roskear and Wheal Seton Sampling.
21. Th. Queen Victoria proclaimed. Copper Ore Ticketing at Andrews'. Devon Consols.
22. F. Summer commences.
23. S. Akenside died, 1770.
24. S. THIRD SUNDAY AFTER TRINITY. Midsummer Day.
25. M.
26. T. North Pool account at the Mine. Liverpool taken, 1644. George IV. died, 1830.
27. W. Carn Brea Sampling.
28. Th. Copper Ore Ticketing at Farquharson's Hotel, Truro. United, &c.
29. F. Queen Victoria crowned, 1838. Julian the Apostate died, 363. St. Peter.
30. S. Greenwich Hospital founded, 1636.

		Memoranda.
1.	S.	
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27.	F.	
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30.	M.	
31.	T.	

Greek Calendar.—Hecatombaion, 30 days. This first month of the Greek year began with the new moon after the summer solstice, and corresponded with the latter part of June and the former of July. The name was derived from *Hecaton* and *bous*, a sacrifice of a hundred oxen, because there were a great number of hecatombs usually sacrificed this month.

Anniversaries, Meetings, &c.

1. ☽. Fourth Sunday after Trinity. Battle of the Boyne, 1690. Battle of the Nile.
2. M. Hungerford Market opened. So. Francis account at Mine.
3. T.
4. W. St. Martin. Devon Consols Sampling.
5. Th. Copper Ore Ticketing at Camborne. N. Roskear and Seton, &c.
6. F. East Pool pay and setting. Cambridge Term ends.
7. S. West Jewel pay and setting. Oxford Trinity Term ends. Sheridan died, 1816.
8. ☽. Fifth Sunday after Trinity. Burke died, 1797.
9. M. County Court at Helston. Fire Insurance expires.
10. T. Calvin born, 1509.
11. W. Consols and United Sampling.
12. Th. Copper Ore Ticketing at Redruth. Carn Brea, &c. Erasmus died, 1536.
13. F. County Court at Redruth.
14. S. County Court at St. Columb.
15. ☽. Sixth Sunday after Trinity. St. Swithin, who caused tithes to be established.
16. M. Sir Joshua Reynolds born, 1723.
17. T. Dr. Watts born, 1674.
18. W. Devon Consols and Great Consols account. North Pool and Seton Sampling.
19. Th. Copper Ore Ticketing at Truro. Devon Consols, &c. Spanish armada arrived, 1588.
20. F. St. Margaret.
21. S.
22. ☽. Seventh Sunday after Trinity.
23. M. Treviskey and Barrier account. Gibraltar taken, 1704.
24. T. Insurances began, 1696. Lupus, Bishop of Troyes, 426.
25. W. Carn Brea Sampling. St. James, or Apple Blessing Day. Duchess of Cambridge born, 1799.
26. Th. Copper Ore Ticketing at Truro. Consols, United Mines, &c.
27. F. Revolution in Paris, 1830. Almanack duty repealed, 1834.
28. S.
29. ☽. St. Martha. Spanish Armada destroyed, 1588.
30. M. William Penn died, 1718.
31. T. Tresavean account at the Mine.

		Memoranda.
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6.	M.	
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9.	Th.	
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13.	M.	
14.	T.	
15.	W.	
16.	Th.	
17.	F.	
18.	S.	
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20.	M.	
21.	T.	
22.	W.	
23.	Th.	
24.	F.	
25.	S.	
26.	S.	
27.	M.	
28.	T.	
29.	W.	
30.	Th.	
31.	F.	

Greek Calendar.—Metageitnion, the 2nd month of the Greek year, comprised 29 days: so called from a festival held this month in honour of *Apollo Metageitnios* by the inhabitants of Melite, who left their homes to settle in Attica under Apollo's guidance, as the name implies a removal from one neighbourhood to another.

Anniversaries, Meetings, &c.

1. W. No Copper Ore Sampling this week. Regent's Canal opened, 1820. Slavery abolished, 1837.
2. Th. Copper Ore Ticketing at Camborn. North Pool, &c.
3. F. East Pool pay and setting. Bank of England begun. Arkwright died, 1792.
4. S. West Jewel pay and setting. East-India Dock opened.
5. ☽. NINTH SUNDAY AFTER TRINITY. Oyster season begins. Earl Howe died, 1799.
6. M. Budnick account at the Mine. Ben Jonson died. Prince Alfred born, 1844.
7. T. South Basset account at the Mine. Q. Caroline died, 1821.
8. W. Devon Consols Sampling. Canning died, 1827.
9. Th. Copper Ore Ticketing at Andrew's, Redruth. Carn Brea, &c.
10. F. County Court at Truro. British Museum established, 1753.
11. S. County Court held at Falmouth.
12. ☽. TENTH SUNDAY AFTER TRINITY.
13. M. Queen Dowager born, 1792. Wheal Seton account.
14. T. Printing invented, 1441.
15. W. Wheal Mary account at the Mine. United and Consols Samp.
16. Th. No Copper Ore Ticketing this week.
17. F. Duchess of Kent born, 1786. County Court held at Redruth.
18. S. Total eclipse of the Sun, invisible. County Court at St. Columb.
19. ☽. ELEVENTH SUNDAY AFTER TRINITY.
20. M.
21. T. Condurron and E. Pool accounts at the Mine.
22. W. N. Roskear and Wheal Seton Sampling.
23. Th. Copper Ore Ticketing at Redruth. Stamps on Newspapers, 1713. American War, 1775.
24. F. St. Bartholomew's Day.
25. S. Herschel died, 1822.
26. ☽. TWELFTH SUNDAY AFTER TRINITY. P. ALBERT born, 1819.
27. M. Liverpool incorporated, 1207.
28. T. North Pool account at the Mine.
29. W. Carn Brea Sampling. John Locke born, 1632.
30. Th. Copper Ore Ticketing at Redruth, United, and Consols Mines, &c. &c. Paley born, 1743.
31. F. John Bunyan died.

		Memoranda.
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4.	T.	
5.	W.	
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10.	M.	
11.	T.	
12.	W.	
13.	Th.	
14.	F.	
15.	S.	
16.	S.	
17.	M.	
18.	T.	
19.	W.	
20.	Th.	
21.	F.	
22.	S.	
23.	S.	
24.	M.	
25.	T.	
26.	W.	
27.	Th.	
28.	F.	
29.	S.	
30.	S.	

Greek Calendar.—Boedromion, the 3rd month of the Greek year, comprising 30 days: so named from the Athenian festival *Boedromia*, a name derived from *ton boedromein* "coming to help," to commemorate the assistance afforded to the Athenians by Ion, the son of Xuthus, when they were invaded by Eumolpus, the son of Neptune, in the reign of king Erechtheus.

Anniversaries, Meetings, &c.

1. S. St. Giles.
2. ☽. Thirteenth Sunday after Trinity. Partial eclipse of the Moon. London burnt, 1666.
3. M. Cromwell died, 1658. South Francis account at the Mine.
4. T.
5. W. Devon Consols Sampling. First American congress, 1774.
6. Th. Copper Ore Ticketing at White's Hotel, Pool, North Roskear, Seton, and other Mines.
7. F. East Pool pay and setting. Buffon born, 1707.
8. S. West Jewel pay and setting. British Association annual meeting at Edinburgh, 1834.
9. ☽. Fourteenth Sunday after Trinity. William the Conqueror died, 1087.
10. M. Paper made in England, 1588. Mungo Park died, 1771.
11. T. Tea first imported, 1391.
12. W. Consols and United Sampling. Siege of Vienna, 1683.
13. Th. Copper Ore Ticketing at Redruth, Carn Brea, and other Mines. Death of Gen. Wolfe, 1759.
14. F. Holy Rood. Sir John Leach, Master of Rolls, died, 1834.
15. S.
16. ☽. Fifteenth Sunday after Trinity. Moscow burnt, 1812.
17. M. Treviskey and Barrier account. London and Birmingham Railway opened, 1830. Queen of Portugal installed, 1834.
18. T. Dr. S. Johnson born, 1709.
19. W. Devon Consols and Great Consols accounts. Wheal Seton and North Pool Sampling.
20. Th. Copper Ore Ticketing at Pearce's Hotel, Truro. Devon Consols and other Mines.
21. F. St. Matthew.
22. S. Newport Office opened, 1829.
23. ☽. Sixteenth Sunday after Trinity. Autumn commences.
24. M. Death of Don Pedro, 1834.
25. T. Tresavean account at the Mine. Dr. A. Clarke died, 1832.
26. W. Carn Brea Sampling. Lord Collingwood born, 1748.
27. Th. Copper Ore Ticketing at Pearce's, Truro. Consols and United.
28. F. Sheriffs of London sworn.
29. S. St. Michael. Michaelmas Day. Lord Mayor elected.
30. ☽. Seventeenth Sunday after Trinity. St. Jerome.

		Memoranda.
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8.	M.	
9.	T.	
10.	W.	
11.	Th.	
12.	F.	
13.	S.	
14.	S.	
15.	M.	
16.	T.	
17.	W.	
18.	Th.	
19.	F.	
20.	S.	
21.	S.	
22.	M.	
23.	T.	
24.	W.	
25.	Th.	
26.	F.	
27.	S.	
28.	S.	
29.	M.	
30.	T.	
31.	W.	

Greek Calendar.—Pyanepsion, the 4th month of the Greek year, including 30 days. It was so called from an Athenian festival, on which occasion the people were accustomed to boil pulse, and eat it in commemoration of the meals which Theseus and his young companions made on his safe return from Crete to Athens. The etymology of the word expresses this.

Anniversaries, Meetings, &c.

1. M. Budnick ac. at the Mine. London University opened, 1828.
2. T. South Basset account.
3. W. Treleigh Consols Annual Meeting. Devon Consols Sampling. King's College opened, 1831.
4. Th. Copper Ore Ticketing at Pool, N. Pool, Wheal Seton, and other Mines. Bible first printed in England, 1535.
5. F. East Pool pay day. Old Parr died, 1635. Horace Walpole died, 1717.
6. S. Faith. Louis Philippe born, 1773.
7. ℣. Eighteenth Sunday after Trinity.
8. M. Wheal Seton account. Gun Cotton patented, 1846.
9. T. St. Denis, patron St. of France. Eddiston Lighthouse, 1759.
10. W. Wheal Mary account. United Mines Sampling. Oxford and Cambridge Michaelmas Term begins.
11. Th. Old Michaelmas Day. Copper Ore Ticketing at Redruth, Carn Brea, and other Mines.
12. F. Wat Tyler died. Stray Park account. America dis. 1492.
13. S. Canova died, 1822.
14. ℣. Nineteenth Sunday after Trinity. China trade opened, 1833.
15. M. Fire Insurance expires.
16. T. East Pool and Condurron ac. Houses of Parliament b. 1834.
17. W. N. Roskear, N. Pool, and Seton Samplings.
18. Th. Copper Ore Ticketing at Redruth, Devon Consols, &c.
19. F. Swift died, 1745. Sir G. Kneller died, 1723.
20. S. Battle Navarino, 1827. Antiquarian Society Charter, 1751. Sir C. Wren born, 1632.
21. ℣. Twentieth Sunday after Trinity. L. Nelson killed, 1805.
22. M.
23. T. Royal Exchange founded, 1667.
24. W. Carn Brea Sampling. First British Parliament, 1707.
25. Th. St. Crispin's Day. Copper Ore Ticketing at Farquharson's Hotel, Truro. United and other Mines.
26. F. Riots at Bristol, 1831.
27. S. Capt. Cook born, 1728. Sir W. Raleigh beheaded, 1618.
28. ℣. Twenty-first Sunday after Trinity. St. Simon.
29. M. Morland died, 1804. Sheridan born, 1751. Locke d. 1704.
30. T. North Pool account at the Mine. Tower armoury burnt, 1841.
31. W. No Copper Ore Sampling this week. Blackfriars Bridge begun, 1760.

		Memoranda.
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11.	S.	
12.	M.	
13.	T.	
14.	W.	
15.	Th.	
16.	F.	
17.	S.	
18.	S.	
19.	M.	
20.	T.	
21.	W.	
22.	Th.	
23.	F.	
24.	S.	
25.	S.	
26.	M.	
27.	T.	
28.	W.	
29.	Th.	
30.	F.	

Greek Calendar.—Maimacterion, 29 days. This 5th and wintry month was so called from a solemn sacrifice offered by the Athenians to Jupiter Maimactes, imploring mild and temperate weather. This surname is explained by some to mean impetuous, because this month is usually boisterous and rainy; while others explain it as meaning favourable or propitious. Many of these derivations are necessarily uncertain, but in this case either explanation may be reconciled with the object of the festival.

Anniversaries, Meetings, &c.

1. Th. All Saints. Copper Ore Ticketing at Redruth. N. Roskear and Seton, &c. The great Earthquake at Lisbon, 1755.
2. F. All Souls. East Pool pay day. Michaelmas Term begins.
3. S. West Jewel pay day.
4. ✠. Twenty-second Sunday after Trinity. St. Petersburg Imp. Academy of Fine Arts instituted, 1764.
5. M. Gunpowder Plot, 1605. Hogarth died, 1764.
6. T.
7. W. Devon Consols Sampling. First newspaper at Oxford, 1665.
8. Th. Copper Ore Ticketing at Andrews' Hotel, Carn Brea, &c.
9. F. P. of Wales and D. of Cornwall born, 1841. L. Mayor's Day.
10. S. Luther born, 1483. Penny Postage, 1840.
11. ✠. Twenty-third Sunday after Trinity.
12. M. Cambridge Term division.
13. T. Curran died, 1817.
14. W. Bruce discovered source of Nile, 1770. United and Consols Sampling. Acad. of Arts at Rome established, 1593.
15. Th. No Copper Ore Ticketing this week.
16. F. Rubens born, 1577. East-India House built, 1786.
17. S. Lotteries abolished. Opening Westminster Bridge, 1750.
18. ✠. Twenty-fourth Sunday after Trinity.
19. M. Treviskey and Barrier account. Charles I. beheaded, 1600. Blackfriars Bridge opened, 1776.
20. T. The Cape doubled, 1497.
21. W. Devon Consols and Great Consols account. East Crofty and Wheal Seton Sampling. Princess Royal born, 1840.
22. Th. St. Cecilia. Copper Ore Ticketing, Truro. Devon Consols and other Mines. Committee of Fine Arts issued, 1841.
23. F. St. Clement. Old Martinmas Day.
24. S. Peace with America, 1814.
25. ✠. Twenty-fifth Sunday after Trinity.
26. M. Michaelmas Law Term ends. Cowper born, 1731.
27. T. Tresavean account at the Mine. Post Office established, 1560.
28. W. Carn Brea Sampling. Cardinal Wolsey died, 1530.
29. Th. Copper Ore Ticketing, Truro. United and Consols. The "Times" newspaper printed by steam, 1814.
30. F. St. Andrew's Day. Water-Colour Society founded, 1804. Sir C. Wren elected President Royal Society, 1681.

		Memoranda.
1.	S.	
2.	S.	
3.	M.	
4.	T.	
5.	W.	
6.	Th.	
7.	F.	
8.	S.	
9.	S.	
10.	M.	
11.	T.	
12.	W.	
13.	Th.	
14.	F.	
15.	S.	
16.	S.	
17.	M.	
18.	T.	
19.	W.	
20.	Th.	
21.	F.	
22.	S.	
23.	S.	
24.	M.	
25.	T.	
26.	W.	
27.	Th.	
28.	F.	
29.	S.	
30.	S.	
31.	M.	

Greek Calendar.—Poseideon, 30 days, the 6th month of the Grecian year: so called of *Poseidon, i. e.* Neptune, to whom they offered a simple sacrifice, called Oneilion, at this season.

Anniversaries, Meetings, &c.

1. S. West Jewel pay and setting. Art-Union chartered, 1846.
2. ☽. Advent Sunday. Napoleon crowned, 1804.
3. M. St. Paul's Cathedral finished, 1710. Wheal Budnick ac. James II. abdicated, 1688. Belzoni died, 1823.
4. T. South Basset account. Woollen cloth made, 1331.
5. W. Devon Consols and other Mines Copper Ore Sampling. Mozart died, 1792.
6. Th. St. Nicholas. Copper Ore Ticketing at Redruth, E. Crofty, Seton, and other Mines.
7. F. East Pool pay day and setting. Sydney beheaded.
8. S. Conception B. V. M. Flaxman, sculptor, died, 1826. Milton born, 1608.
9. ☽. Second Sunday in Advent. Washington died, 1799.
10. M. Wheal Seton account at the Mine. Royal Academy established, 1768. Hogarth born, 1697.
11. T. Charles XII. killed.
12. W. Wheal Mary account at the Mine. United and Consols Sampling.
13. Th. Copper Ore Ticketing at Redruth, Carn Brea, and other Mines. Dr. Johnson died, 1781.
14. F. Stray Park account. Isaac Walton died, 1683.
15. S. Calico introduced into Britain, 1772.
16. ☽. Third Sunday in Advent. Cambridge Mich. Term ends.
17. M. Sir Humphrey Davy born, 1778. Oxford Mich. Term ends.
18. T. Condurron and East Pool account at the Mines.
19. W. Ember Week. East Crofty, Wheal Seton, and other Mines Sampling. Rubens born, 1577.
20. Th. Copper Ore Ticketing at Redruth. Devon Consols and other Mines. Dulwich Gallery founded, 1810.
21. F. St. Thomas. Shortest day.
22. S. Winter commences. Banks, sculp. born, 1735.
23. ☽. Fourth Sunday in Advent. Sir R. Arkwright, b. 1732.
24. M.
25. T. Christmas Day. Sir Isaac Newton born, 1642.
26. W. St. Stephen. North Pool account. Carn Brea Sampling.
27. Th. St. John Evan. Copper Ore Ticketing at Andrews' Hotel. United and Consols account. Greenwich Railway op. 1829.
28. F. Innocents' Day.
29. S. Wycliffe died, 1384.
30. ☽. First Sunday after Christmas. Great frost, 1794.
31. M.

Days.	JANUARY.				FEBRUARY.				MARCH.				APRIL.				MAY.				JUNE.			
	Sun.		Moon.		Sun.		Moon.		Sun.		Moon.		Sun.		Moon.		Sun.		Moon.		Sun.		Moon.	
	Rises	Sets.	Rises	Sets.	Rises	Sets.	Rises	Sets.	Rises	Sets.	Rises	Sets.	Rises	Sets.	Rises	Sets.	Rises	Sets.	Rises	Sets.	Rises	Sets.	Rises	Sets.
	H. M.	H. M.	H. M.	H. M.	H. M.	H. M.	H. M.	H. M.	H. M.	H. M.	H. M.	H. M.	H. M.	H. M.	H. M.	H. M.	H. M.	H. M.	H. M.	H. M.	H. M.	H. M.	H. M.	H. M.
1	8 8	4 0	11 28	11 48	7 41	4 47	11 31	1 21	6 48	5 38	10 12	0 24	5 38	6 31	11 42	2 26	4 35	7 21	1 6	2 20	3 51	8 4	3 25	2 9
2	8 8	4 1	11 54	Morn	7 40	4 49	Aft.	2 33	6 46	5 39	10 57	1 34	5 36	6 33	Aft.	3 10	4 33	7 23	2 15	2 48	3 50	8 5	4 28	2 32
3	8 8	4 2	Aft.	1 1	7 38	4 50	1 0	3 43	6 44	5 41	11 49	2 39	5 34	6 35	2 4	3 45	4 31	7 24	3 21	3 14	3 50	8 6	5 33	2 57
4	8 8	4 3	0 55	2 18	7 36	4 52	1 57	4 48	6 42	5 43	Aft.	3 38	5 31	6 37	3 15	4 17	4 29	7 26	4 28	3 38	3 49	8 7	6 22	3 25
5	8 8	4 4	1 32	3 34	7 34	4 54	3 0	5 45	6 40	5 44	1 55	4 28	5 29	6 38	4 23	4 43	4 28	7 27	5 33	4 2	3 49	8 8	7 31	3 57
6	8 7	4 6	2 17	4 50	7 32	4 56	4 11	6 33	6 38	5 46	3 5	5 10	5 27	6 40	5 31	5 10	4 26	7 29	6 37	4 26	3 48	8 9	8 25	4 34
7	8 7	4 7	3 12	6 0	7 30	4 58	5 24	7 13	6 36	5 48	4 16	5 44	5 24	6 41	6 37	5 32	4 24	7 30	7 39	4 53	3 47	8 10	9 16	5 16
8	8 7	4 8	4 14	7 2	7 29	5 0	6 37	7 45	6 33	5 50	5 28	6 14	5 22	6 43	7 43	5 57	4 22	7 32	8 39	5 22	3 47	8 11	9 59	6 3
9	8 6	4 9	5 24	7 56	7 27	5 2	7 47	8 14	6 31	5 51	6 36	6 41	5 20	6 44	8 47	6 23	4 21	7 34	9 37	5 56	3 46	8 12	10 38	6 56
10	8 6	4 10	6 36	8 41	7 26	5 4	8 57	8 42	6 28	5 53	7 45	7 6	5 18	6 46	9 49	6 50	4 19	7 35	10 29	6 35	3 46	8 12	11 11	7 55
11	8 5	4 11	7 48	9 17	7 24	5 5	10 3	9 4	6 26	5 55	8 52	7 32	5 15	6 47	10 48	7 21	4 17	7 36	11 16	7 19	3 45	8 13	11 40	8 57
12	8 4	4 13	9 0	9 48	7 22	5 7	11 8	9 30	6 24	5 57	9 56	7 58	5 13	6 48	11 42	7 56	4 16	7 38	11 58	8 10	3 45	8 14	Morn	10 4
13	8 3	4 14	10 8	10 15	7 20	5 9	Morn	9 54	6 21	5 59	10 59	8 22	5 11	6 50	Morn	8 38	4 14	7 39	Morn	9 4	3 45	8 15	0 8	11 12
14	8 2	4 16	11 16	10 39	7 18	5 11	0 11	10 21	6 18	6 0	Midn	8 51	5 9	6 52	0 32	9 25	4 12	7 41	0 35	10 5	3 45	8 16	0 33	Aft.
15	8 2	4 18	Morn	11 4	7 16	5 13	1 12	10 50	6 16	6 2	Morn	9 23	5 7	6 54	1 18	10 18	4 11	7 42	1 7	11 9	3 44	8 16	0 57	1 36
16	8 1	4 19	0 20	11 27	7 14	5 14	2 10	11 27	6 13	6 4	0 56	10 1	5 5	6 55	1 59	11 16	4 10	7 44	1 36	Aft.	3 44	8 16	1 27	2 52
17	8 0	4 21	1 23	11 53	7 12	5 16	3 7	Aft.	6 11	6 6	1 50	10 45	5 2	6 57	2 34	Aft.	4 8	7 45	2 4	1 29	3 44	8 16	1 55	4 10
18	7 59	4 22	2 26	Aft.	7 10	5 18	3 59	0 53	6 9	6 8	2 39	11 34	5 0	6 59	3 6	1 26	4 7	7 47	2 31	2 42	3 44	8 17	2 30	5 29
19	7 58	4 24	3 26	0 51	7 8	5 20	4 46	1 46	6 7	6 9	3 23	Aft.	4 58	7 1	3 35	2 37	4 5	7 48	2 57	3 59	3 44	8 18	3 10	6 45
20	7 57	4 26	4 23	1 28	7 7	5 21	5 28	2 44	6 5	6 11	4 2	1 31	4 56	7 2	4 2	3 48	4 4	7 49	3 26	5 18	3 44	8 18	3 59	7 55
21	7 55	4 27	5 18	2 11	7 5	5 23	6 7	3 50	6 3	6 12	4 37	2 38	4 55	7 4	4 30	5 8	4 3	7 51	3 59	6 39	3 44	8 18	4 58	8 53
22	7 55	4 29	6 8	3 1	7 3	5 25	6 40	4 59	6 1	6 14	5 8	3 49	4 53	7 6	5 0	6 28	4 1	7 52	4 37	7 58	3 45	8 19	6 8	9 45
23	7 54	4 31	6 52	3 59	7 1	5 27	7 10	6 11	5 59	6 15	5 37	5 3	4 51	7 8	5 28	7 48	4 0	7 53	5 23	9 10	3 45	8 19	7 20	10 25
24	7 53	4 33	7 34	5 2	6 59	5 29	7 37	7 25	5 57	6 17	6 5	6 18	4 49	7 10	6 6	9 7	3 59	7 55	6 18	10 14	3 45	8 19	8 34	10 59
25	7 51	4 35	8 8	6 4	6 56	5 30	8 4	8 39	5 54	6 18	6 33	7 36	4 47	7 11	6 47	10 20	3 58	7 57	7 21	11 7	3 46	8 18	9 48	11 26
26	7 50	4 37	8 45	7 14	6 54	5 32	8 33	9 54	5 52	6 20	7 2	8 54	4 45	7 13	7 37	11 26	3 57	7 58	8 29	11 50	3 46	8 18	10 58	11 51
27	7 48	4 39	9 7	8 25	6 52	5 34	9 2	11 10	5 50	6 22	7 34	10 11	4 43	7 14	8 34	Morn	3 56	7 59	9 41	Morn	3 46	8 18	Aft.	Morn
28	7 47	4 40	9 34	9 37	6 50	5 36	9 35	Morn	5 47	6 24	8 11	11 25	4 41	7 16	9 36	0 23	3 55	8 0	10 54	0 25	3 47	8 18	1 15	0 14
29	7 45	4 41	10 1	10 51					5 45	6 26	8 54	Morn	4 39	7 17	10 44	1 11	3 54	8 1	Aft.	0 54	3 48	8 18	2 10	0 38
30	7 44	4 43	10 28	Morn					5 43	6 28	9 45	0 34	4 37	7 19	11 55	1 49	3 53	8 2	1 12	1 21	3 49	8 18	3 24	1 2
31	7 43	4 45	10 59	0 4					5 41	6 30	10 43	1 34					3 52	8 3	2 20	1 44				

Days.	JULY.				AUGUST.				SEPTEMBER.				OCTOBER.				NOVEMBER.				DECEMBER.			
	Sun.		Moon.		Sun.		Moon.		Sun.		Moon.		Sun.		Moon.		Sun.		Moon.		Sun.		Moon.	
	Rises	Sets.	Rises	Sets.	Rises	Sets.	Rises	Sets.	Rises	Sets.	Rises	Sets.	Rises	Sets.	Rises	Sets.	Rises	Sets.	Rises	Sets.	R ses	Sets.	Rises	Sets.
	H. M.	H. M.	H. M.	H. M.	H. M.	H. M.	H. M.	H. M.	H. M.	H. M.	H. M.	H. M.	H. M.	H. M.	H. M.	H. M.	H. M.	H. M.	H. M.	H. M.	H. M.	H. M.	H. M.	H. M.
1	3 49	8 17	4 26	1 29	4 25	7 46	5 55	1 54	5 13	6 46	6 20	3 34	6 1	5 40	5 41	4 44	6 56	4 32	5 37	7 23	7 46	3 52	5 47	8 43
2	3 49	8 17	5 24	1 58	4 27	7 44	6 39	2 44	5 15	6 44	6 48	4 41	6 3	5 38	6 7	5 58	6 56	4 31	6 17	8 40	7 47	3 52	6 50	9 47
3	3 50	8 16	6 20	2 34	4 28	7 43	7 16	3 40	5 16	6 42	7 13	5 50	6 5	5 35	6 35	7 11	6 59	4 29	7 6	9 55	7 48	3 51	7 58	10 42
4	3 51	8 16	7 12	3 14	4 29	7 41	7 49	4 42	5 18	6 40	7 38	6 59	6 7	5 32	7 6	8 28	7 1	4 27	8 3	11 1	7 49	3 51	9 1h	11 27
5	3 52	8 16	7 58	4 0	4 31	7 40	8 17	5 46	5 20	6 37	8 6	8 14	6 9	5 29	7 41	9 43	7 2	4 26	9 8	11 59	7 51	3 51	10 30	Aft.
6	3 53	8 15	8 39	4 52	4 33	7 38	8 43	6 53	5 21	6 35	8 34	9 27	6 10	5 27	8 23	10 57	7 4	4 24	10 18	Aft.	7 52	3 51	11 43	0 30
7	3 54	8 15	9 14	5 49	4 35	7 36	9 10	8 2	5 23	6 32	9 4	10 40	6 12	5 24	9 13	Aft.	7 6	4 23	11 30	1 25	7 53	3 50	Morn	0 58
8	3 55	8 14	9 46	6 50	4 36	7 34	9 34	9 13	5 24	6 29	9 42	11 55	6 14	5 22	10 11	1 8	7 7	4 22	Morn	1 57	7 55	3 50	0 54	1 23
9	3 56	8 14	10 13	7 57	4 38	7 32	10 1	10 23	5 26	6 27	10 26	Aft.	6 16	5 20	11 16	2 0	7 9	4 20	0 42	2 27	7 56	3 50	2 2	1 45
10	3 57	8 13	10 39	9 2	4 39	7 31	10 30	11 37	5 27	6 25	11 18	2 13	6 17	5 18	Morn	2 45	7 10	4 19	1 53	2 52	7 57	3 49	3 1h	2 9
11	3 58	8 13	11 4	10 12	4 41	7 29	11 2	Aft.	5 29	6 23	Morn	3 12	6 19	5 15	0 27	3 21	7 12	4 18	3 2	3 15	7 58	3 49	4 16	2 35
12	3 59	8 12	11 39	11 22	4 43	7 27	11 41	2 6	5 31	6 20	0 18	4 3	6 20	5 13	1 39	3 52	7 14	4 16	4 11	3 40	7 59	3 49	5 20	3 4
13	4 0	8 11	11 56	Aft.	4 44	7 25	Morn	3 16	5 32	6 18	1 26	4 46	6 22	5 10	2 52	4 20	7 16	4 14	5 19	4 5	8 0	3 49	6 22	3 37
14	4 1	8 10	Morn	1 50	4 45	7 23	0 30	4 21	5 34	6 16	2 39	5 21	6 24	5 8	4 4	4 47	7 18	4 12	6 25	4 32	8 0	3 49	7 21	4 14
15	4 2	8 9	0 27	3 5	4 46	7 21	1 27	5 19	5 35	6 14	3 52	5 52	6 25	5 6	5 14	5 12	7 20	4 11	7 29	5 1	8 1	3 49	8 13	4 58
16	4 3	8 8	1 4	4 21	4 48	7 19	2 32	6 9	5 37	6 12	5 7	6 18	6 27	5 4	6 23	5 36	7 22	4 10	8 30	5 35	8 2	3 49	9 2	5 47
17	4 4	8 7	1 47	5 32	4 49	7 17	3 43	6 49	5 38	6 9	6 20	6 45	6 28	5 2	7 31	6 3	7 23	4 9	9 28	6 16	8 3	3 49	9 45	6 42
18	4 5	8 6	2 40	6 37	4 51	7 15	4 59	7 23	5 40	6 7	7 30	7 9	6 30	5 0	8 37	6 31	7 25	4 8	10 19	7 1	8 4	3 50	10 11	7 40
19	4 6	8 5	3 43	7 31	4 52	7 13	6 15	7 53	5 42	6 5	8 39	7 36	6 31	4 58	9 40	7 3	7 27	4 7	11 5	7 52	8 5	3 50	10 53	8 42
20	4 8	8 4	4 43	8 16	4 54	7 11	7 28	8 20	5 43	6 2	9 46	8 2	6 32	4 56	10 39	7 39	7 28	4 6	11 46	8 49	8 5	3 51	11 21	9 47
21	4 9	8 3	6 9	8 55	4 55	7 9	8 39	8 45	5 45	6 0	10 49	8 32	6 34	4 54	11 35	8 22	7 30	4 5	Aft.	9 50	8 6	3 51	11 47	10 52
22	4 10	8 2	7 24	9 26	4 57	7 7	9 49	9 9	5 47	5 58	10 52	9 6	6 36	4 52	Aft.	9 9	7 31	4 3	0 50	10 54	8 6	3 51	Aft.	11 59
23	4 11	8 0	8 39	9 53	4 59	7 5	10 56	9 34	5 48	5 56	Aft.	9 45	6 38	4 50	1 7	10 2	7 33	4 2	1 16	Midn	8 6	3 52	0 34	Morn
24	4 12	7 58	9 52	10 20	5 0	7 3	Aft.	10 2	5 50	5 54	1 41	10 30	6 40	4 47	1 45	11 2	7 35	4 0	1 42	Morn	8 7	3 52	1 0	1 12
25	4 14	7 56	10 51	10 42	5 2	7 1	1 4	10 34	5 51	5 52	2 28	11 20	6 42	4 45	2 18	Morn	7 36	3 58	2 8	1 9	8 7	3 53	1 27	2 24
26	4 15	7 54	Aft.	11 6	5 3	6 59	2 3	11 10	5 53	5 50	3 10	Morn	6 44	4 43	2 47	0 5	7 38	3 57	2 23	2 21	8 7	3 53	1 59	3 40
27	4 17	7 53	1 12	11 32	5 5	6 57	2 58	11 51	5 55	5 47	3 47	0 16	6 46	4 41	3 16	1 11	7 39	3 56	3 0	3 34	8 8	3 54	2 38	4 59
28	4 19	7 51	2 16	Morn	5 7	6 55	3 48	Morn	5 56	5 45	4 18	1 17	6 48	4 39	3 40	2 20	7 40	3 55	3 30	4 52	8 8	3 55	3 26	6 15
29	4 21	7 50	3 15	0 1	5 8	6 53	4 33	0 38	5 58	5 43	4 47	2 23	6 50	4 37	4 5	3 32	7 42	3 54	4 6	6 12	8 9	3 56	4 25	7 25
30	4 23	7 49	4 13	0 34	5 10	6 51	5 14	1 31	5 59	5 41	5 14	3 31	6 51	4 36	4 34	4 47	7 44	3 54	4 53	7 29	8 9	3 57	5 33	8 29
31	4 24	7 47	5 6	1 12	5 12	6 48	5 49	2 31					6 53	4 34	5 3	6 4					8 9	3 58	6 48	9 21

Changes of the Moon.

JANUARY.—First Qu., 2d. 7h. 38m. A.M. Full M., 8d. 10h. 50m. P.M. Last Qu., 16d. 6h. 54m. A.M. New M., 24d. 10h. 3m. A.M. New M., 24d. 10h. 3m. A.M. First Qu., 31d. 4h. 43m. P.M. Perigee, 7d. 3h. Apogee, 18d. at Midnight.

FEBRUARY.—Full M., 7d. 11h. 16m. A.M. Last Qu., 15d. 4h. 3m. A.M. New M., 23d. 1h. 30m. A.M. Perigee, 3d. 9h. P.M. Apogee, 15d. 7h. P.M.

MARCH.—First Qu., 2d. 0h. 3m. A.M. Full M., 9d. 1h. 2m. A.M. Last Qu., 17d. 0h. 39m. A.M. New M., 24d. 2h. 6m. P.M. First Qu., 31d. 6h. 58m. A.M. Perigee, 1d. 5h. A.M. Apogee, 15d. 4h. P.M. Perigee, 27d. 11h. A.M.

APRIL.—Full M., 7d. 3h. 50m. P.M. Last Qu., 15d. 7h. 8m. P.M. New M., 22d. 11h. 54m. P.M. First Qu., 29d. 2h. 17m. P.M. Apogee, 12d. 10h. A.M. Perigee, 24d. 10h. A.M.

MAY.—Full M., 7d. 7h. 7m. A.M. Last Qu., 15d. 10h. 30m. A.M. New M., 22d. 7h. 37m. A.M. First Qu., 28d. 11h. 23m. P.M. Apogee, 9d. 9h. P.M. Perigee, 22d. 6h. P.M.

JUNE.—Full M., 5d. 10h. 27m. P.M. Last Qu., 13d. 10h. 24m. P.M. New M., 20d. 2h. 19m. P.M. First Qu., 27d. 10h. 44m. A.M. Apogee, 6d. 3h. A.M. Perigee, 20d. 5h. A.M.

JULY.—Full M., 5d. 1h. 29m. P.M. Last Qu., 13d. 7h. 8m. A.M. New M., 19d. 9h. 15m. P.M. First Qu., 27d. 0h. 35m. A.M. Apogee, 3d. 8h. A.M. Perigee, 18d. 2h. P.M. Apogee, 30d. 7h. P.M.

AUGUST.—Full M., 4d. 3h. 52m. A.M. Last Qu., 11d. 1h. 33m. P.M. New M., 18d. 5h. 33m. A.M. First Qu., 25d. 4h. 56m. P.M. Perigee, 15d. 3h. P.M. Apogee, 27d. 11h. A.M.

SEPTEMBER.—Full M., 2d. 5h. 18m. P.M. Last Qu., 9d. 6h. 55m. P.M. New M., 16d. 4h. 2m. P.M. First Qu., 24d. 11h. 24m. A.M. Perigee, 11d. 10h. A.M. Apogee, 24d. 6h. A.M.

OCTOBER.—Full M., 2d. 5h. 33m. P.M. Last Qu., 9d. 0h. 44m. A.M. New M., 16d. 5h. 13m. P.M. First Qu., 24d. 7h. 4m. A.M. Full M., 31d. 4h. 47m. P.M. Perigee, 6d. 10h. A.M. Apogee, 22d. 3h. A.M.

NOVEMBER.—Last Qu., 7d. 8h. 23m. A.M. New M., 14d. 9h. 13m. P.M. First Qu., 23d. 2h. 24m. A.M. Full M., 30d. 3h. 25m. A.M. Perigee, 2d. 11h. P.M. Apogee, 18d. 9h. P.M.

DECEMBER.—Last Qu., 6d. 6h. 53m. P.M. New M., 14d. 3h. 38m. First Qu., 22d. 7h. 40m. P.M. Full M., 29d. 2h. P.M. Perigee, 1d. 4h. A.M. Apogee, 16d. 6h. A.M. Perigee, 29d. 4h. P.M.

TIDE TABLE OF THE PRINCIPAL PORTS,

Showing the time of High Water by adding or subtracting the numbers annexed, from those giving the time of High Water at London Bridge.

	h. m		h. m		h. m
Aberdovy	Add 5 23	Guernsey Pier	Add 4 23	Agnes, St. Lights	Add 2 23
Aberystwith	Add 5 23	Hastings	Sub. 3 31	Amsterdam	Add 0 53
Achill Head	Add 3 53	Holyhead	Sub. 4 7	Antwerp	Add 2 18
Agnes (St.) Scilly Isles	Add 2 23	Howth Harbour	Sub. 2 59	Archangel	Add 3 53
Air Point, Isle of Man	Sub. 3 0	Kenmare River	Add 1 23	Bayonne	Add 1 23
Alderney Pier, E. Channel	Add 4 38	Kinsale Harbour	Add 2 23	Bergen	Sub. 0 37
Arran Isle, Scot.	Sub. 2 52	Kirkcudbright	Sub. 2 52	Bermudas (Isle)	Add 4 53
Baltimore	Add 1 38	Land's End	Add 2 23	Blanco (Cape) Af.	Sub. 4 23
Banff	Sub. 1 26	Leith Pier	Add 0 15	Boston	Sub. 2 42
Bantry Bay	Add 1 39	Limerick	Add 4 23	Botany Bay	Sub. 5 53
Barmouth	Add 5 48	Lizard	Add 0 8	Boulogne	Sub. 2 41
Barnstaple Bar	Add 3 23	Londonderry	Add 3 55	Bordeaux	Add 4 45
Beachy, on Shore	Sub. 3 52	Lowestoff	Sub. 3 37	Bremen	Add 3 53
Beachy (Offing)	Sub. 3 7	Lynn Regis	Add 4 38	Brest	Add 1 39
Beaumaris	Sub. 3 41	Margate	Sub. 2 2	Cadiz	Add 0 23
Belfast	Sub. 4 2	Milford Haven	Add 3 38	Caen	Sub. 5 7
Berwick	Add 0 11	Montrose	Sub. 0 22	Calais	Sub. 2 19
Blakeney Harb.	Add 4 43	Mount's Bay	Add 2 33	Calcutta	Add 0 58
Bridgewater	Add 4 38	Needle's Point	Sub. 4 22	Charlotte(Q.) Sd.	Sub. 5 7
Bridport	Add 3 53	Newcastle	Add 1 58	Cherbourg	Add 5 23
Brighton	Sub. 3 0	Newport	Add 4 38	Christmas Harb.	Sub. 4 7
Cardigan Bar	Add 4 53	Newhaven	Sub. 2 17	ChristmasSound	Add 0 23
Caermarthen	Add 4 3	Nore Light	Sub. 0 58	Churchill River	Add 5 13
Carlisle	Sub. 2 7	Orfordness	Sub. 3 27	Cornwallis(Port)	Add 4 7
Carnarvon	Sub. 4 47	Orkney Isles	Sub. 3 37	Dieppe	Sub. 3 2
Chester Bar	Sub. 3 37	Pembroke	Add 3 57	Drake's Island	Add 3 38
Clear Cape	Add 1 53	Penzance	Add 2 23	Drontheim	Add 0 8
Cork Harbour	Add 2 23	Peterhead	Sub. 1 22	Fayal Town	Add 0 13
Cornwall Cape	Add 2 23	Plymouth	Add 3 26	Francisco (St.)	Sub. 2 42
Cowes, I. of W.	Sub. 3 22	Portland Race	Sub. 4 52	Gibraltar	Sub. 2 8
Cromartie	Sub. 2 22	Portland Road	Add 4 8	Good Hope (C.)	Add 0 53
Dartmouth	Add 3 58	Port Patrick	Sub. 3 7	Good Hope (Tn.)	Add 0 23
Deal	Sub. 2 52	Portsmouth	Sub. 2 27	Goree (Isle)	Sub. 0 37
Dingle Bay	Add 1 23	Ramsgate	Sub. 2 47	Granville	Add 4 2
Donaghadee	Sub. 4 52	Rye Harbour	Sub. 3 27	Gravelines	Sub. 2 14
Donegal Bar	Add 2 58	Scarborough	Add 2 18	Hague	Add 6 8
Dover Pier	Sub. 2 57	Scilly Islands	Add 2 25	Halifax	Add 5 23
Downs (Stream)	Add 0 38	Selsea Harbour	Sub. 2 52	Hamburgh	Add 3 35
Dublin Bar	Sub. 2 55	Shannon Mouth	Add 1 43	Havre de Grace	Sub. 4 15
Dudgeon Lights	Add 5 23	Sheerness	Sub. 1 28	Helena (St.)	Add 0 8
Dunbar	Sub. 0 13	Shields	Add 0 53	Hogue (Cape la)	Sub. 2 7
Duncansby Head	Sub. 5 52	Shoreham	Sub. 2 52	Honfleur	Sub. 4 37
Dundalk	Sub. 3 7	Sligo Bay	Add 3 52	John's, St. Amer.	Add 3 53
Dundee	Add 0 28	Southampton	Sub. 2 27	Lisbon	Add 0 8
Dungarvon	Add 2 23	Spithead	Sub. 4 37	Madeira	Sub. 2 3
Dungeness	Sub. 3 17	St. Ives	Add 2 23	Maloes (St.)	Add 3 53
Eddystone	Add 3 8	Sunderland	Add 0 53	Monterey	Add 5 23
Edinburgh	Add 2 23	Swansea	Add 3 48	Nantes	Add 0 53
Exmouth Bar	Add 4 18	Tees River	Add 1 23	New York	Sub. 5 7
Eyemouth	Add 0 8	Torbay	Add 3 58	Nieuport	Sub. 2 22
Falmouth	Add 9 8	Tralee Bay	Add 1 38	Nootka Sound	Sub. 1 17
Flamboro' Head	Add 2 23	Tynemouth	Add 0 43	Ostend	Sub. 1 12
Folkestone, W.P.	Sub. 3 37	Waterford	Add 3 43	Philadelphia	Add 0 53
Foreland, North	Sub. 2 22	Wexford	Add 5 23	Pickersgill's Har.	Sub. 3 10
Foreland, South	Sub. 2 47	Weymouth	Add 4 23	P. of Wales's Fort	Add 5 13
Fowey	Add 3 23	Whitby	Add 1 38	Quebec	Add 5 23
Galloway (Mull)	Sub. 2 52	Whitehaven	Sub. 2 52	Resolution Bay	Add 0 23
Galway Bay	Add 2 23	Wicklow	Sub. 5 7	Rio Janeiro	Sub. 0 2
Gravesend	Sub. 0 37	Wisbeach	Add 5 23	Rochelle	Sub. 1 38
Greenock	Sub. 2 22	Yarmouth Roads	Sub. 5 27	Rochfort	Sub. 2 8
Greenwich	Sub. 0 20	Yarmouth Sands	Sub. 3 37	Rotterdam	Add 0 53
		Youghall	Add 2 53	Rouen	Sub. 0 52
		Abbeville	Sub. 3 37	Senegal	Sub. 3 37
				Valery sur Som.	Sub. 4 7

TIDE TABLE, Showing the Times of HIGH WATER at London Bridge throughout the Year.

Days.	January.		February.		March.		April.		May.		June.		July.		August.		September.		October.		November.		December.	
	Morn.	After.	Morn.	After.	Morn.	After.	Morn.	After.	Morn.	After.	Morn.	After.	Morn.	After.	Morn.	After.	Morn.	After.	Morn.	After.	Morn.	After.	Morn.	After.
	H. M.	H. M.	H. M.	H. M.	H. M.	H. M.	H. M.	H. M.	H. M.	H. M.	H. M.	H. M.	H. M.	H. M.	H. M.	H. M.	H. M.	H. M.	H. M.	H. M.	H. M.	H. M.	H. M.
1	6 10	6 35	7 25	7 53	6 15	6 35	7 50	8 30	9 0	9 40	10 50	11 20	11 5	11 37	N. T.	0 25	1 10	1 30	1 20	1 38	2 5	2 24	2 25	2 45
2	6 58	7 25	8 25	9 5	7 2	7 30	9 15	9 59	10 20	11 0	11 55	N. T.	N. T.	0 8	0 50	1 15	1 50	2 10	1 55	2 15	2 44	3 5	3 10	3 30
3	7 55	8 25	9 45	10 25	8 4	8 40	10 40	11 25	11 33	Midn	0 15	0 40	0 32	0 55	1 35	1 55	2 30	2 45	2 35	2 50	3 25	3 45	3 55	4 20
4	9 2	9 36	11 10	11 45	9 25	10 10	Noon	N. T.	N. T.	0 37	1 2	1 25	1 15	1 40	2 14	2 30	3 0	3 20	3 10	3 30	4 10	4 30	4 45	5 10
5	10 15	10 54	N. T.	0 20	10 53	11 40	0 28	0 55	0 50	1 12	1 45	2 0	1 55	2 15	2 50	3 10	3 35	3 50	3 45	4 5	4 55	5 15	5 35	6 5
6	11 30	Midn	0 52	1 20	N. T.	0 15	1 20	1 40	1 33	1 53	2 20	2 40	2 35	2 55	3 25	3 40	4 10	4 30	4 25	4 45	5 40	6 10	6 30	7 0
7	N. T.	0 32	1 48	2 10	0 44	1 10	2 0	2 15	2 10	2 25	2 55	3 10	3 10	3 30	4 0	4 15	4 45	5 5	5 10	5 30	6 35	7 10	7 30	8 0
8	1 0	1 30	2 35	3 0	1 37	2 0	2 35	2 50	2 45	3 0	3 30	3 45	3 45	4 0	4 32	4 50	5 25	5 45	5 55	6 20	7 45	8 27	8 40	9 15
9	1 55	2 20	3 20	3 40	2 20	2 40	3 10	3 25	3 15	3 30	4 0	4 20	4 20	4 35	5 10	5 30	6 10	6 35	6 50	7 20	9 10	9 50	9 50	10 25
10	2 45	3 10	3 58	4 17	3 0	3 20	3 40	4 0	3 50	4 5	4 35	4 55	4 55	5 15	5 50	6 10	7 0	7 35	7 55	8 40	10 30	11 10	11 0	11 30
11	3 35	3 55	4 35	4 54	3 35	3 53	4 15	4 30	4 20	4 35	5 10	5 30	5 35	5 55	6 35	7 0	8 10	8 50	9 25	10 10	11 40	N. T.	Noon	N. T.
12	4 17	4 40	5 15	5 30	4 10	4 25	4 45	5 0	4 55	5 10	5 50	6 10	6 15	6 40	7 25	7 55	9 35	10 15	10 55	11 30	0 5	0 30	0 24	0 47
13	5 0	5 20	5 50	6 5	4 45	5 0	5 20	5 35	5 30	5 50	6 40	7 0	7 5	7 30	8 30	9 10	11 0	11 40	N. T.	0 1	0 53	1 15	1 8	1 30
14	5 40	6 0	6 23	6 40	5 15	5 35	5 54	6 10	6 10	6 35	7 30	8 0	7 57	8 27	9 45	10 25	N. T.	0 12	0 25	0 50	1 35	1 50	1 48	2 7
15	6 20	6 45	7 3	7 25	5 50	6 7	6 35	7 0	7 0	7 27	8 30	9 10	9 5	9 37	11 10	11 45	0 40	1 10	1 15	1 35	2 10	2 30	2 25	2 45
16	7 5	7 25	7 50	8 20	6 25	6 45	7 25	8 0	8 0	8 37	9 40	10 15	10 11	10 47	N. T.	0 20	1 35	1 57	1 55	2 15	2 45	3 0	3 0	3 18
17	7 50	8 20	9 0	9 40	7 5	7 30	8 40	9 20	9 15	9 50	10 45	11 15	11 22	11 55	0 50	1 20	2 15	2 40	2 35	2 50	3 20	3 35	3 35	3 50
18	8 55	9 30	10 20	10 55	8 0	8 45	10 0	10 35	10 25	11 0	11 45	N. T.	N. T.	0 30	1 45	2 10	2 55	3 15	3 5	3 25	3 50	4 7	4 7	4 25
19	10 5	10 40	11 34	N. T.	9 24	10 5	11 10	11 45	11 30	11 55	0 15	0 45	0 57	1 25	2 35	2 55	3 35	3 50	3 40	4 0	4 20	4 40	4 40	5 0
20	11 15	11 50	0 10	0 40	10 45	11 25	N. T.	0 13	N. T.	0 25	1 10	1 37	1 52	2 20	3 20	3 40	4 10	4 30	4 15	4 30	4 55	5 15	5 15	5 36
21	N. T.	0 20	1 0	1 24	N. T.	Noon	0 38	1 0	0 45	1 10	2 2	2 30	2 45	3 10	3 55	4 15	4 40	5 0	4 45	5 0	5 35	5 55	5 55	6 15
22	0 44	1 7	1 45	2 5	0 30	0 55	1 20	1 40	1 35	1 55	2 55	3 22	3 35	3 55	4 40	5 0	5 20	5 30	5 20	5 40	6 18	6 40	6 40	7 0
23	1 28	1 50	2 23	2 42	1 15	1 35	2 0	2 20	2 20	2 45	3 45	4 10	4 19	4 40	5 15	5 35	5 55	6 10	5 58	6 20	7 5	7 40	7 30	8 0
24	2 10	2 27	3 0	3 20	1 55	2 15	2 45	3 5	3 10	3 35	4 35	5 0	5 0	5 25	5 55	6 15	6 35	6 55	6 45	7 10	8 15	8 55	8 30	9 10
25	2 45	3 5	3 35	3 55	2 33	2 50	3 25	3 50	3 55	4 20	5 20	5 50	5 47	6 10	6 30	6 55	7 25	7 55	7 45	8 30	9 28	10 5	9 40	10 15
26	3 20	3 40	4 10	4 32	3 10	3 30	4 10	4 35	4 45	5 10	6 10	6 35	6 30	6 55	7 15	7 40	8 35	9 15	9 10	9 50	10 35	11 10	10 50	11 25
27	3 57	4 15	4 50	5 10	3 49	4 10	4 55	5 20	5 35	6 0	7 3	7 30	7 15	7 40	8 10	8 50	9 58	10 35	10 27	11 0	11 40	N. T.	11 55	N. T.
28	4 35	4 50	5 30	5 52	4 30	4 50	5 45	6 10	6 30	6 57	8 0	8 30	8 5	8 35	9 25	10 5	11 15	11 50	11 35	11 59	0 5	0 30	0 20	0 47
29	5 10	5 30			5 13	5 35	6 40	7 10	7 30	7 57	9 0	9 35	9 10	9 45	10 45	11 20	N. T.	0 15	N. T.	0 23	0 50	1 15	1 15	1 40
30	5 50	6 10			5 57	6 20	7 40	8 20	8 32	9 15	10 5	10 30	10 18	10 55	11 55	N. T.	0 40	1 0	0 45	1 6	1 40	2 0	2 5	2 30
31	6 35	7 0			6 50	7 20			9 45	10 15			11 25	Midn	0 25	0 50			1 25	1 44			3 0	3 25

PART II.

Scientific Bodies.

SOCIETIES FOR THE PROMOTION OF ENGINEERING, MINING, AND ALLIED SCIENCES.

Birmingham. Institution of Mechanical Engineers.
Dublin..... Royal Dublin Society.
Institution of Civil Engineers.
Edinburgh.. Scottish Society of Arts.
Wernerian Society.
Liverpool .. Polytechnic Institution.
London .... Institution of Civil Engineers.
Geological Society.
Society of Arts.
Chemical Society.
Paris ..... Institution of Civil Engineers.
Philadelphia. Franklin Institute.
Truro ..... Royal Cornwall Geological Society.
Polytechnic Society.

MUSEUMS OF ENGINEERING, MINING, AND ALLIED SCIENCES.

Bristol..... Bristol Institution.
Dublin..... Royal Dublin Society.
Durham .... College Museum.
London .... British Museum.
Geological Society.
Museum of Economic Geology.
Royal Polytechnic Institution.
United Service Museum.
Mr. Sanll's Museum of Geology, Aldersgate-street.
Society of Arts.
York..... Yorkshire Philosophical Society.

LIBRARIES OF ENGINEERING, MINING, AND ALLIED SCIENCES.

Dublin..... Trinity College.
Royal Dublin Society.
Edinburgh.. Advocates' Library.
Glasgow.... University Library.
London .... British Museum.
Institution of Civil Engineers.
Geological Society.
Putney College.
Truro ..... Royal Cornwall Institution.

SCHOOLS OF ENGINEERING, MINING, AND ALLIED SCIENCES.

Bombay .... Elphinstone College.
Chatham.... Military Academy (Engineering).
Cirencester.. Royal Agricultural College (Geology, Chemistry, and Surveying).
Dublin..... Trinity College (Engineering, Geology, and Chemistry).
Royal Dublin Society (Geology and Chemistry).
Durham.... University College (Engineering, Geology, and Chemistry).
Glasgow.... University College (Engineering and Chemistry).
London .... University College (Engineering, Geology, and Chemistry).
King's College (Engineering, Geology, and Chemistry).
Royal Institution (Chemistry).
Museum of Economic Geology (Mineralogy).
Royal Polytechnic Institution (Chemistry and Steam-Engines).
College for Chemistry (Chemistry).
Putney College (Engineering, Geology, and Chemistry).
St. Salvador. St. Andrew's College (Engineering and Chemistry).

CHEMICAL LABORATORIES.

Belfast .... Royal Academical Institution.
Birmingham. Queen's College.
Bristol..... Medical School.
Dublin..... Trinity College.
Royal Dublin Society.
Apothecaries' Hall.
Durham.... University College.
Edinburgh.. University.
Glasgow.... University.
Andersonian University.
Liverpool .. Medical School.
London .... University College.
King's College.
Museum of Economic Geology.
Royal Polytechnic Institution.
College for Chemistry.
Putney College.
The Medical School of St. Bartholomew's,
St. Thomas's,
St. George's,
Guy's,
London,
Middlesex,
Charing Cross, and
Westminster Hospitals.
Royal Military Academy, Woolwich.
Royal Institution.
London Institution.
Apothecaries' Hall.
Manchester.. Medical School.
Newcastle .. Medical School.

THE ROYAL SOCIETY.

HER SACRED MAJESTY QUEEN VICTORIA, PATRON.

Date of Election.

1840. Apr. 30.—His Royal Highness Prince Albert of Saxe Coburg and Gotha.
1838. Apr. 24.—His Royal Highness Ernest Augustus, Duke of Cumberland, King of Hanover.
1817. May 22.—His Imperial Majesty Nicholas, Emperor of all the Russias.
1842. Jan. 20.—His Majesty Frederick William IV., King of Prussia.
1816. — His Majesty Leopold, King of the Belgians.
1822. June 6.—His Majesty Christian VIII., King of Denmark, D.C.L.
1844. June 13.—His Majesty Frederick, King of Saxony.
1836. Dec. 21.—His Majesty Oscar I., King of Sweden and Norway.
1838. May 24.—His Imperial and Royal Highness Leopold the Second, Grand Duke of Tuscany.
1816. Feb. 8.—His Imperial Highness the Archduke John of Austria.
1816. Feb. 8.—His Imperial Highness the Archduke Louis of Austria.
1902. Mar. 4.—His Imperial Highness the Archduke Maximilian of Austria.

The Council.

The Earl of Rosse, *President*.

G. Rennie, Treasurer.
S. H. Christie, M.A., Secretary.
W. R. Grove, M.A., Secretary.
Lieut.-Col. E. Sabine, R.A., Foreign Sec.
G. B. Airy, M.A.
T. Bell.
Sir J. Clark, Bart., M.D.
J. P. Gassiot.
T. Graham, M.A.
L. Horner.
Sir R. H. Inglis, Bart., LL.D.
J. G. S. Lefevre, M.A.
Sir C. Lyell, M.A.
W. A. Miller, M.D.
The Marquis of Northampton.
R. Owen.
J. Phillips.
P. M. Roget, M.D.
The Dean of Westminster.
C. Wheatstone.

Scientific Committees.

1.—MATHEMATICS.

Very Rev. the Dean of Ely, *Chairman*. Mr. Christie, *Secretary*.

Mr. Airy.
Mr. Hargreave.
Mr. Galloway.
Mr. Gompertz.
Mr. Graves.
Sir J. F. W. Herschel, Bt.
Mr. Hopkins.
Rev. P. Kelland.
Rev. Dr. Lloyd.
Sir J. W. Lubbock, Bart.
Mr. H. Fox Talbot.
Rev. W. Whewell.

2.—ASTRONOMY.

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Very Rev. the Dean of Ely.
Mr. Galloway.
Sir J. F. W. Herschel, Bt.
Sir J. W. Lubbock, Bart.
Sir J. C. Ross, R.N.
The Earl of Rosse.
Rev. R. Sheepshanks.
Capt. Smyth, R.N.
Lieut. Stratford, R.N.
Lord Wrottesley.

3.—PHYSICS, INCLUDING METEOROLOGY.

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Mr. Airy.
Mr. Barlow.
Admiral Beaufort, R.N.
Sir D. Brewster.
Mr. Christie.
Maj.-Gen. Colby.
Dr. Daubeny.
Very Rev. the Dean of Ely.
Mr. Faraday.
Mr. J. D. Forbes.
Mr. Gassiot.
Mr. Grove.
Sir W. S. Harris.
Mr. Hopkins.
Mr. L. Howard.
Rev. P. Kelland.
Rev. Dr. Lloyd.
Sir J. W. Lubbock, Bart.
Mr. Miller.
Mr. J. Phillips.
Rev. B. Powell.
Sir J. C. Ross, R.N.
Lieut.-Col. Sabine.
Lieut.-Col. Sykes.
Mr. H. F. Talbot.
Rev. W. Whewell.
Rev. R. Willis.
Rev. R. Walker.

4.—CHEMISTRY.

Mr. R. Phillips, *Chairman.* Mr. Graham, *Secretary.*

Mr. Children.	Mr. Fownes.	Mr. Pepys.
Rev. J. Cumming.	Mr. Hatchett.	Dr. Prout.
Dr. Daubeny.	Mr. Johnston.	Mr. E. Solly.
Mr. Faraday.	Dr. Miller.	Dr. T. Thomson.

5.—MINERALOGY AND GEOLOGY.

Dr. Fitton, *Chairman.* Dr. Mantell, *Secretary.*

Mr. H. J. Brooke.	Mr. Jameson.	Sir R. I. Murchison.
Mr. Darwin.	Mr. Lyell.	Mr. J. Phillips.
Sir H. T. De la Beche.	Mr. Horner.	Rev. A. Sedgwick.
Mr. Greenough.	Mr. Miller.	Mr. Taylor.

Very Rev. the Dean of Westminster.

6.—BOTANY AND VEGETABLE PHYSIOLOGY.

Dr. Wallich, *Chairman.* Dr. Royle, *Secretary.*

Mr. Bennett.	Mr. Forster.	Dr. Pereira.
Dr. Daubeny.	Sir W. J. Hooker, K.H.	Mr. R. H. Solly.
Mr. Dillwyn.	Dr. Horsfield.	Mr. H. F. Talbot.
Mr. E. Forbes.	Dr. Lindley.	Mr. D. Turner.

7.—ZOOLOGY AND ANIMAL PHYSIOLOGY.

Sir B. C. Brodie, Bart., *Chairman.* Mr. Bell, *Secretary.*

Dr. M. Barry.	Mr. Green.	Dr. Rees.
Mr. Bishop.	Mr. R. Jones.	Sir J. Richardson.
Mr. Bowman.	Mr. Kiernan.	Dr. Roget.
Dr. Clark.	Mr. Lawrence.	Dr. Roupell.
Mr. Clift.	Mr. Owen.	Dr. Sharpey.
Mr. E. Forbes.	Dr. Prichard.	Dr. Todd.
Mr. J. E. Gray.		

By a Resolution of the Council (April 11th, 1839), the President, Treasurer, and Secretaries are *ex-officio* Members of all Committees.

Fellows of the Society.

Date of Election.

1808. Aberdeen, G., Earl of, K.T. Trust. Brit. Mus.—President of the Society of Antiquaries, F.L.S. Argyll-house.
1847. Ackland, H. W. D., M.D. Oxford.
1839. Acland, Sir T. Dyke, Bart., F.G.S. Killerton-park, Devon.
1845. Adair, R. S. 7, Audley-square.
1834. Adare, E., Viscount, F.R.A.S. Adare-abbey, Limerick; Dunraven-castle, Glamorganshire.
1846. Addison, W., M.D., F.L.S. Great Malvern.
1832. Agar, Hon. G. C., M.A. University Club.
1836. Airy, G. B., M.A., D.C.L., Astronomer Royal, V.P.R.A.S.—Hon. Mem. R.S.E., R.I.A., R.I.S.W., F.C.P.S. The Royal Observatory, Greenwich.
1841. Alderson, J., M.D., Coll. Reg. Med. Socius. 36, Charles-street, Berkeley-sq.
1847. Alexander, H. 6, Cork-street.
1844. Allen, W., Capt. R.N. Athenæum Club.
1824. Amyot, T. Treas. S.A., Hon. M.R.I.A. Soc. Reg. Antiq. Septen. Hafn. Socius. 13, James-street, Westminster.
1831. Andrew, J., LL.D.
1834. Ansell, C., F.S.A. Tottenham.
1844. Ansted, D. T., M.A., F.G.S., F.L.S., F.C.P.S., Professor of Geology, King's College, London. 36, Gloucester-road, Hyde Park-gardens.

1840. Archibald, C. D., F.S.A., F.G.S., M.R.I. 3, York-terrace, Regent's-park.
1845. Armstrong, W. G. Newcastle-upon-Tyne.
1843. Arnott, J. M. 2, New Burlington-street.
1838. Arnott, N., M.D. 38, Bedford-square.
1836. Audubon, J. J., F.L.S.
1840. Auldjo, J. Noel-house, Kensington.
1837. Ayrton, W., F.S.A. 39, Dorset-square.
1816. Babbage, C., M.A., F.R.S.E., Hon. M.R.I.A., F.R.A.S., M.C.P.S. Inst. Reg. Sc. Paris., Corresp. Acadd. Reg. Sc. Masil., Hafn., et Divion. ex intim., &c. 1, Dorset-street, Manchester-square.
1816. Baber, Rev. H. H., M.A., M.R.S.L., &c. Streatham, Cambridgeshire.
1828. Babington, B. G., M.D., Coll. Reg. Med. Socius. 31, George-street.
1847. Back, Sir G., Knt., Capt. R.N. Gloucester-place, Portman-square.
1836. Baillie, D. 14, Belgrave-square.
1842. Baily, E. H., R.A. 10, Percy-street, Tottenham-court-road.
1847. Baly, W., M.D., Coll. Reg. Med. Socius. 28, Spring-gardens.
1845. Bandon, Right Hon. Earl. 6, Hyde Park-terrace.
1834. Barlow, Rev. J., M.A., F.L.S., Sec. R.I. 5, Berkeley-street, Piccadilly.
1823. Barlow, P., F.R.A.S., Hon. M.C.P.S., &c. Royal Mil. Academy, Woolwich.
1845. Barlow, P. W. 8, Elliot-place, Blackheath.
1809. Barnwell, C. F., M.A., F.S.A. 44, Woburn-place, Russell-square.
1823. Baron, J., M.D. Cheltenham.
1844. Barrow, J. 7, New-street, Spring-gardens.
1840. Barry, M., M.D., F.R.S.E., Coll. Reg. Med. Edin. Socius. Edinburgh.
1838. Bateman, J., F.L.S. Knypersley-hall, Staffordshire.
1827. Beamish, Maj. N. L., K.H. Windham Club, St. James's-square,
1836. Beamish, R.
1814. Beaufort, F., Capt. R.N., F.G.S., F.R.A.S., &c. Admiralty.
1815. Beaufoy, H., F.L.S. South Lambeth.
1835. Beaumont, E. B., F.R.A.S. 144, Piccadilly.
1824. Beechey, F. W., Capt. R.N., F.R.A.S. 8, Westbourne-crescent.
1835. Beetham, A. W., F.S.A. 3, Serjeants'-Inn, Fleet-street.
1838. Bell, T., F.L.S., F.G.S., Socc. Hist. Nat. et Philomath., Paris, &c. 17, New Broad-street.
1834. Bellamy, Rev. J. W., B.D. Sellinge Vicarage, Ashford, Kent.
1841. Bennett, J. J., Sec. L.S. British Museum.
1831. Beverly, C. J., F.L.S. 1, Hackney-grove, Hackney.
1822. Bexley, N. Lord, M.A., F.S.A., M.R.S.L. 31, Great George-street.
1827. Bicheno, J. E., F.L.S., F.G.S., Col. Sec. Van Diemen's Land, Hobarton.
1844. Billing, A., M.D., Coll. Reg. Med. Socius, &c. 6, Grosvenor-gate, Park-lane.
1846. Bird, G., A.M., M.D., Coll. Reg. Med. Socius. 19, Myddleton-square.
1848. Bishop, G. South Villa, Regent's-park.
1844. Bishop, J. 38, Bernard-street, Russell-square.
1830. Blake, Capt. B., F.G.S., F.R.A.S. India.
1843. Blake, H. W. Soho, Birmingham; and 62, Portland-place.
1807. Blake, W., M.A., F.G.S. 62, Portland-place.
1831. Blake, W. J. 62, Portland-place.
1841. Blakiston, P., M.D., Coll. Reg. Med. Socius. Birmingham.
1816. Bland, M., F.S.A., F.G.S. St. Leonard's, Hastings.
1821. Bland, Rev. M., D.D., F.S.A., F.R.A.S., M.R.S.L. Lilley Rectory, Luton.
1841. Blore, E. 4, Manchester-square.
1837. Boase, H., M.D., F.G.S. Claverhouse, near Dundee.
1840. Boileau, J. T., Major E.I.C.S. India.
1843. Boileau, Sir J., Bart. 20, Upper Brook-street.
1840. Bonner, Col. J. G., E.I.C.S. 11 A, Great Cumberland-street.
1834. Booth, Sir F., Bart. 43, Portland-place; and Hendon, Middlesex.
1846. Booth, Rev. J., LL.D., M.R.I.A. Everton, Liverpool.
1835. Borrer, W., F.L.S. Henfield, Sussex.
1829. Bosworth, Rev. J., LL.D., F.S.A., M.R.I.A. 9, Southampton-st., Bloomsb.
1839. Botfield, B., M.P., F.S.A., F.R.A.S., F.G.S., F.L.S. Norton-hall, Northamp.
1814. Boughton, Sir W. E. R., Bart. Downton-hall, Ludlow.
1842. Bowerbank, J. S., F.G.S. 3, Highbury-grove.
1841. Bowman, W. 14, Golden-square.
1809. Brande, W. T., F.R.S.E. Royal Mint.
1821. Brandreth, T. S. University Club.
1834. Breadalbane, J. C., Marquis of, K.T. 21, Park-lane.

1815. Brewster, Sir D., K.H., LL.D., F.R.S.E., Hon. M.R.I.A., F.G.S., F.R.A.S., &c. St. Andrew's.
1838. Briggs, Maj.-Gen. J., E.I.C.S., M.R.A.S., F.G.S. 3, Charles-st., St.James's.
1821. Bright, R., M.D., Coll. Reg. Med. Socius, F.G.S., &c. 11, Saville-row.
1810. Brisbane, Lieut.-Gen. Sir T. M., Bart., K.C.B., G.C.H., D.C.L. Makerstown.
1805. Bristol, F. W., Marquis of. 6, St. James's-square.
1834. Brockedon, W. 29, Devonshire-street, Queen-square.
1828. Broderip, W. J., B.A., F.L.S., F.G.S. 2, Raymond's-buildings, Gray's-inn.
1810. Brodie, Sir B. C., Bart. 14, Saville-row.
1817. Bromhead, Sir E. F., Bart., M.A., F.R.S.E., F.R.A.S. Thurlby, Lincolnshire.
1823. Brooke, Sir A. B. de Capell, Bart., M.A., F.L.S., F.G.S. Okeley.
1847. Brooke, C., B.A. 29, Keppel-street, Russell-square.
1819. Brooke, H. J., F.L.S., F.G.S. Clapham-rise.
1803. Brougham, H., Lord, M.A. 4, Grafton-street.
1842. Broughton, R. E. 1, Melcombe-place.
1811. Brown, R., D.C.L., Hon. Mem. R.S.E., R.I.A., &c. 17, Dean-street, Soho.
1838. Brownlow, J., Earl, D.C.L., F.S.A., F.L.S., F.G.S., M.R.A.S. 12, Belgrave-square.
1829. Bruce, Right Hon. Sir J. L. K., Knt., F.S.A. Roehampton Priory.
1830. Brunel, I. K. 18, Duke-street, Westminster.
1814. Brunel, Sir M. I., Knt.
1833. Buccleuch, W. F., Duke of, K.T., D.C.L., F.L.S. Whitehall-gardens.
1818. Buckland, Very Rev. W., D.D., Dean of Westminster, F.L.S., V.P.G.S., &c. Deanery, Westminster.
1836. Budd, G., M.D., Coll. Reg. Med. Socius. 20, Dover-street, Piccadilly.
1846. Buist, G., D.C.L. Bombay.
1829. Burlington, W., Earl of, M.A. 10, Belgrave-square.
1835. Burnes, J., K.H., D.C.L. India.
1837. Burnet, J. 12, Sloane-street.
1838. Burnet, Rev. T., D.D. 13, Finsbury-square.
1833. Burnett, Sir W., K.C.H., M.D., &c. 5, Somerset-place.
1814. Burney, Rev. C. P., D.D., F.S.A., F.L.S., F.G.S., F.R.A.S., M.R.A.S., M.R.S.L. Rectory-house, Sible Hedingham, Essex.
1829. Burns, J., M.D. Glasgow.
1818. Burrow, Rev. E. J., D.D., F.G.S. Gibraltar.
1847. Burrows, G., M.D. 45, Queen Anne-street, Cavendish-square.
1836. Burt, Major T. S., M.R.A.S. India.
1832. Burton, D., F.S.A. 6, Spring-gardens.
1836. Burton, E., F.L.S. Brooklyn, near Maidstone.
1844. Bury, E. Hanslope-park, Newport Pagnell.
1819. Butler, the Very Rev. G., D.D., Dean of Peterborough, F.S.A., F.R.A.S.
1822. Butter, J., M.D., F.L.S. Windsor-villas, Plymouth.
1837. Cabbell, B. B., F.S.A. 1, Brick-court, Temple, and Portland-place.
1810. Cadell, W. A., F.R.S.E., F.G.S. Edinburgh.
1831. Caldcleugh, A., F.L.S., F.G.S. Chili.
1840. Caldecott, J., F.R.A.S. Observatory, Travancore, India.
1839. Carington, R. J., Lord. Whitehall-yard; and Wycombe-abbey, Bucks.
1826. Carleton, Hon. and Rev. R., M.A. Greywell-hill, Odiham, Hampshire.
1818. Carne, J., M.R.I.A., F.G.S. Penzance.
1844. Carpenter, W. B., M.D. 6, Regent's-park-terrace.
1800. Carrington, Sir C. E., Knt., D.C.L., F.S.A., M.R.A.S.
1841. Cartwright, S., F.L.S. 32, Old Burlington-street.
1846. Cautley, P. T., Major, F.G.S. India.
1812. Cawdor, J. F., Earl, Trust. Brit. Mus., F.G.S. 74, South Audley-street.
1848. Challis, Rev. J. Cambridge.
1828. Chambers, W. F., M.D., K.C.H., Physician to the Queen. 46, Brook-street.
1833. Chandler, Very Rev. G., Dean of Chichester, D.C.L., M.R.S.L., R.G.S. 36, Mortimer-street.
1815. Chapman, Major-Gen. Sir S. R., C.B., K.C.H. Tainfield-house, Somerset.
1836. Chapman, J. J., Capt. R.A. Athenæum Club.
1842. Chapman, T., F.S.A. Whitby, Yorkshire.
1834. Chesney, Lieut.-Colonel F. R., R.A. 11, Wilton-terrace, Grosvenor-place.
1807. Children, J.G., F.R.S.E., F.S.A., F.L.S. 48, Torrington-square.
1826. Christie, S. H., M.A., V.P., R.A.S., F.C.P.S. Royal Mil. Acad., Woolwich.
1842. Christmas, Rev. H., M.A., F.S.A. Sion College, London Wall.
1833. Christopher, R. A. D. 97, Eaton-square.

1818. Churchill, F. A., Lord. Cornbury-park, near Witney, Oxfordshire.
1832. Clark, Sir J., Bart., M.D., Physician to the Queen. 22 B, Brook-street.
1836. Clark, W., M.D. Cambridge.
1837. Clark, W. T. Hammersmith.
1825. Clarke, Sir C. M., Bart., M.D., LL.D. Wigginton-lodge, Tamworth.
1830. Clarke, L. L., M.A. India.
1841. Clendinning, J., M.D., Col. Reg. Med. Socius. 16, Wimpole-street.
1819. Clerk, Sir G., Bart., D.C.L., M.P., F.R.S.E., F.G.S. 8, Park-street.
1848. Clerk, Capt. H., R.A. Woolwich (abroad).
1833. Clerke, Major T. H. S., K.H., R.E., F.R.A.S. 4, Brompton-grove.
1823. Clift, W., F.G.S. Stanhope-cottage, Mornington-road, Regent's-park.
1830. Cockburn, Vice-Admiral, Right Hon. Sir G., G.C.B., G.C.H., F.R.A.S.
1822. Codrington, Vice-Admiral Sir E., G.C.B. Admiralty-house, Portsmouth.
1830. Colby, Maj.-Gen., R.E., LL.D., F.R.S.E., Hon. M.R.I.A., F.G.S., F.R.A.S., M.R.A.S., Ordnance Map Office, Southampton.
1830. Collier, Charles, M.D., F.G.S. 20, Fitzroy-square.
1830. Colquhoun, Lieut.-Colonel J. N., R.A. Athenæum Club.
1819. Conybeare, Very Rev. W. D., Dean of Llandaff, M.A., F.G.S. Llandaff.
1840. Cook, T., Lieut. R. N., Professor of Fortification, E. I. C. Military Academy, Addiscombe.
1829. Cooper, B. B. 2, New-street, Spring-gardens.
1832. Cooper, C. P., LL.D., Hon. M.R.I.A. 7, New Boswell-court, Lincoln's-inn.
1846. Cooper, S. 7, Woburn-place.
1834. Copeland, T. 17, Cavendish-square.
1833. Copland, J., M.D. 5, Old Burlington-street.
1821. Cotton, W., F.S.A. 3, Crosby-square, Bishopsgate-street.
1836. Cox, W. S. Birmingham.
1812. Crampton, Sir P. C., Bart., D.C.L. Dublin.
1818. Crawford, J., F.L.S., F.G.S., M.R.A.S.
1842. Creuze, A. F. B. 14, Grosvenor-place, New-road, Kennington.
1800. Crichton, Sir A., Knt., M.D., F.L.S., F.G.S. Seal Chart, Sevenoaks, Kent.
1818. Croft, Sir J., Bart., K.T.S., D.C.L. Milgate, near Maidstone.
1810. Croker, Right Hon. J. W., LL.D.
1836. Crosse, J. G., M.D. Norwich.
1843. Crozier, F. R. M., Capt. R.N.
1844. Crum, W. Thornlie Bank, near Glasgow.
1830. Cubitt, W. M.R.I.A., F.R.A.S. 6, Great George-street, Westminster.
1807. Cuming, Lieut.-General Hon. J. L.
1816. Cumming, Rev. J., M.A., Professor of Chemistry. Cambridge.
1838. Cureton, Rev. W., M.A. 37, Queen Anne-street; and British Museum.
1841. Cursetjee, A. Bombay.
1828. Daniell, E. R. Birmingham.
1822. Dartmouth, W., Earl of, D.C.L., F.S.A. 23, St. James's-square.
1834. Darwin, C., M.A., Sec. G.S. Down, near Bromley, Kent.
1822. Daubeny, C. G. B., M.D., Hon. M.R.I.A., F.L.S., F.G.S. Oxford.
1831. Davies, G. 25, Duncan-terrace, City-road.
1833. Davies, T. S., F.R.S.E., F.S.A. Royal Military Academy, Woolwich.
1841. Davis, H. 17, Oxford-square, Hyde-park.
1822. Davis, Sir J. F., Bart. Portland-place; and Hollywood, Compton, Bristol.
1826. Davy, E., M.R.I.A. Dublin.
1814. Davy, J., M.D., F.R.S.E. Ambleside, Westmorland.
1815. Dawkins, J. C., F.S.A. Ham-common, Richmond.
1805. De Blaquiere, Lord. Holly-house, New Kent-road.
1819. De la Beche, Sir H. T., Knt., Vice-President, F.L.S., F.G.S., Director-General of the Geological Survey of the United Kingdom. Museum of Economic Geology, 6, Craig's-court, Charing-cross.
1839. Denham, H. M., Commander R.N. 89, Pall Mall; and Athenæum.
1841. Denham, Rev. J. F., M.A. 1, New-inn.
1838. Denison, Sir W. T., Capt. R.E., F.R.A.S., F.R.G.S. Lieut.-Governor Van Dieman's Land.
1833. Denman, T., Lord. 38, Portland-place; and Stoney Middleton, Derbyshire.
1829. D'Eyncourt, Right Hon. C. T., F.S.A. 35, Pall-mall.
1845. Dickenson, J., F.G.S., F.R.G.S., F.A.S. Abbott's-hill, Hemel Hempstead.
1804. Dillwyn, L. W., F.L.S., F.G.S. Sketty-hall, near Swansea.
1832. Disney, J., F.S.A. The Hyde, near Ingatestone, Essex.
1811. Dixon, Rev. R., M.A. Niton, Isle of Wight.

1835. Dobson, Sir R., Knt. Royal Hospital, Greenwich.
1819. Dollond, G., F.R.A.S. 59, St. Paul's-churchyard.
1838. Donkin, B., F.R.A.S. 6, Paragon, Kent-road.
1842. Donkin, W. F., M.A. Oxford.
1830. Douglas, G. Chilston, Kent.
1816. Douglas, Major-General Sir H., Bart., C.B., K.S.C., D.C.L., F.S.A. 15, Green-street, Grosvenor-square.
1826. Douglas, W. R. K.
1836. Drory, G. W. 38, Westbourne-terrace, Hyde-park.
1839. Drummond, H. Aldbury-park, Guildford, Surrey.
1808. Duckett, Sir G., Bart., M.A., F.S.A., F.G.S., Hon. M.R.I.S.
1825. D'Urban, Major-General Sir B., K.C.B., K.C.H., K.T.S.
1824. Durham, E. M., D.D., Lord Bishop of, F.S.A. 4, Upper Portland-place.
1847. Dwarris, Sir F., Knt., B.A., F.S.A. 5, James-street, St. James's-park.
1838. Eastlake, C. L., R.A. 13, Upper Fitzroy-street.
1835. Edye, J. 9, Mecklenburg-square.
1841. Edye, J.
1831. Egerton, Sir P. de M. G., Bart., F.G.S. 30, Eaton-place.
1815. Elliot, Sir W. F., Bart. Stobb's-castle.
1834. Elliot, Hon. G., Rear-Admiral. 88, Eaton-place.
1829. Elliotson, J., M.D., Coll. Reg. Med. Socius. 37, Conduit-street.
1835. Elliott, C. 47, Portland-place.
1832. Elliott, Rev. C. B., M.A. 47, Portland-place; and Tattingstone, Suffolk.
1811. Ellis, Sir H., K.H., B.C.L., Sec. S.A., Hon. M.R.I.A. British Museum.
1819. Ellis, Right Hon. H., F.G.S.
1847. Ellis, T. F., M.A., F.R.A.S., F.C.P.S., Attorney-General of the Duchy of Lancaster. 15, Bedford-place.
1832. Elphinstone, Sir H., Bart., M.A., F.G.S.
1841. Enderby, C., F.L.S. Greenwich.
1841. Enfield, Viscount. 77, Eaton-square.
1829. Enniskillen, W. W., Earl of, D.C.L., F.G.S. Athenæum Club.
1837. Everest, Lieut.-Colonel G., Bengal Artillery, F.G.S., F.R.A.S., M.R.A.S. 37, Connaught-square, Hyde-park.
1840. Ewer, W. 23, Hanover-square.
1845. Falconer, H., M.D., F.L.S., F.G.S., Sup. of the E. I. C. Bot. Gard., Calcutta.
1824. Faraday, M., D.C.L., Hon. Mem. R.S.E. & C.P.S., F.G.S. 21, Albemarle-st.
1839. Farre, A., M.D., Coll. Reg. Med. Socius. 22, Curzon-street, May-fair.
1835. Featherstonhaugh, G. W. Havre.
1816. Fellowes, Sir J., Knt., M.D. Pangbourne-lodge, near Reading.
1848. Ferguson, W. King's College.
1836. Field, J. Cheltenham-place, Lambeth.
1842. Fielding, G. H., M.D. The Bower, Maidstone.
1825. Fisher, Rev. G., M.A., F.R.A.S. Royal Hospital, Greenwich.
1815. Fitton, W. H., M.D., F.L.S., F.G.S., F.R.A.S. 53, Upper Harley-street.
1811. Fitzwilliam, C. W., Earl, F.S.A., F.G.S. Mortimer-house, Grosvenor-place.
1839. Fletcher, T. W., F.S.A. Dudley, Worcestershire.
1834. Ffolkes, Sir W. B., Bart. Hillington-hall, Lynn.
1845. Forbes, E., F.L.S., F.G.S., Prof. of Bot. at King's College. King's College.
1832. Forbes, J. D., Professor of Natural Philosophy in the University of Edinburgh, &c. Edinburgh.
1829. Forbes, J., M.D., Coll. Reg. Med. Socius. 12, Old Burlington-street.
1822. Forbes, W. N., F.G.S.
1828. Forshall, Rev. J., M.A., F.S.A., Hon. M.R.I.A., M.R.S.L. British Museum.
1821. Forster, E., V.P.L.S. 11, Mansion-house-street; and Woodford, Essex.
1817. Fortescue, H., Earl, K.P. 17, Grosvenor-sq.; and Castle-hill, Southmolton.
1802. Fowler, R., M.D., F.S.A. Salisbury.
1845. Fownes, G., Professor of Practical Chemistry, University College, London.
1848. Fox, R. W. Falmouth.
1823. Franklin, Sir J., Knt., Capt. R.N., D.C.L., F.L.S., F.R.G.S., F.G.S., F.R.A.S. Acad. Scient. Paris., et Soc. Geogr. Paris. Corresp.
1821. Franks, W., M.A., Wood-hill, Hatfield, Hertfordshire.
1837. Frere, G. E. Roydon-hall, Diss, Norfolk.
1834. Freshfield, J. W., F.G.S. 15, Regent-street; and Leatherhead, Surrey.
1820. Friend, M. C., Lieut. R.N. George Town, Van Diemen's Land.
1839. Frodsham, W. J. Change-alley, Cornhill.
1834. Galloway, T., M.A., F.R.A.S. 45, Torrington-square.

1816. Gardiner, Rev. S. J., M.A.
1839. Gaskin, Rev. T., M.A., F.R.A.S. Jesus College, Cambridge.
1840. Gassiot, J. P., Clapham-common.
1796. Gibbes, Sir G. S., Knt., M.D., F.L.S. 2, Oriel-place, Cheltenham.
1846. Gilbart, I. W. London and Westminster Bank, Lothbury.
1834. Gilbert, J. D., M.A. Eastbourne, Sussex; and Trelissick, Truro, Cornwall.
1828. Glenelg, C., Lord, D.C.L., M.R.S.L. The Albany, Piccadilly.
1838. Glynn, J. Butterley, Derbyshire.
1839. Godwin, G., jun., F.S.A. 11, Pelham-crescent, Brompton.
1808. Goldingham, J., F.R.A.S., M.R.A.S. Worcester.
1828. Goldsmid, Baron de and de Palmeira, F.S.A., F.L.S., F.G.S., F.R.A.S. M.R.S.L. Park Lodge, Regent's-park.
1819. Gompertz, B., F.R.A.S. Kennington-terrace, Vauxhall.
1846. Goodsir, J., Prof. of Anatomy, Univ. of Edinb. 21, Lothian-st., Edinburgh.
1835. Gordon, J. A., M.D., Coll. Reg. Med. Socius. Pelican Life Assurance Office, Lombard-street.
1801. Gordon, Lieut.-General Sir J. W., Bart., K.C.B., G.C.H. Chelsea.
1830. Gordon, H. P., M.A. Chelsea.
1821. Gordon, T., Zante, Ionian Islands.
1839. Goulburn, Right Hon. H., D.C.L., Montague-place, Portman-square.
1843. Gould, J., F.L.S. 90, Broad-street, Golden-square.
1831. Graham, Right Hon. Sir J. R. G., Bart. 46, Grosvenor-place.
1826. Graham, T., M.A., *Vice President*, Professor of Chemistry, University College, London, F.G.S., &c. 9, Torrington-square.
1846. Grainger, R. D., F.R.C.S., F.M.C.S. Highgate.
1840. Grant, T. T. Royal Clarence Victualling-yard, Portsmouth.
1836. Grant, R. E., M.D., F.R.S.E., F.L.S., &c. 10, Grafton-place, Euston-square.
1817. Granville, A. B., M.D., F.G.S., M.R.A.S., &c. 109, Piccadilly.
1832. Gravatt, W. 34, Parliament-street.
1839. Graves, J. T., M.A., M.R.S.L. Poor Law Com. Office, Somerset-house.
1832. Gray, J. E., F.G.S., F.R.G.S., &c. British Museum.
1825. Green, J. H., Professor of Anatomy to the Royal Academy, F.G.S. Barnet.
1807. Greenough, G. B., F.L.S., F.G.S., M.R.A.S. Grove-house, Regent's-park.
1833. Greig, W., M.A. 14, Lower Belgrave-street, Eaton-square.
1830. Gresswell, Rev. R., M.A., Worcester College, Oxford.
1841. Grey, T. P., Earl de, K.G., K.P. 4, St. James's-square.
1834. Griffith, E. 6, Nottingham-terrace, Marylebone.
1806. Griffiths, J.
1840. Grove, W. R., M.A., V.P.R.I., Ph. D., Acad. Reg. Taurin. Corresp. et Soc. Phil. Basil. 27, Upper Gloucester-place, Dorset-square.
1839. Guest, E., 4, King's-bench-walk, Temple.
1830. Guest, Sir J. J., Bart., F.G.S. 8, Spring-gardens.
1839. Gulliver, G. Royal Regiment of Horse Guards.
1818. Gurney, H., F.S.A., M.R.S.L. 9, St. James's-square.
1827. Guthrie, G. J. 4, Berkeley-street, Piccadilly.
1844. Haddington, Right Hon. T., Earl of, K.P. Tyningham Castle, Dunbar.
1820. Hall, Sir J., Bart., F.R.S.E., F.G.S. 69, Lowndes-square.
1832. Hall, M., M.D., F.R.S.E., Col. Reg. Med. Socius. 14, Manchester-square.
1827. Hall, T. H., M.A., 49, Tavistock-square.
1847. Hall, W. H., Capt. R.N. Shipbourne-lodge, Tunbridge.
1821. Hallam, H., M.A., Trust. Brit. Mus., V.P.S.A., F.G.S., F.R.A.S., M.R.S.L., Instit. Reg. Sc. Paris. Socius. 24, Wilton-crescent, Knightsbridge.
1839. Halliwell, J. O., Hon.M.R.I.A., F.S.A.L.&E., F.R.A.S., Hon.M.R.S.L., &c. Avenue-lodge, Brixton-hill.
1808. Hamilton and Brandon, A., Duke of, K.G., F.S.A. 12, Portman-square.
1828. Hamilton, Rev. H. P., M.A., F.G.S., F.R.A.S. Wath Rectory, near Ripon.
1813. Hamilton, W. R., V.P.S.A., V.P.R.S.L., &c. 12, Bolton-row, May-fair.
1836. Hamaler, Sir J. J., Knt., F.S.A. 8, Westbourne-street, Hyde-park-gardens.
1824. Harcourt, Rev. W. V. V., M.A., Hon.M.R.I.A., F.G.S. Weldrake, near York.
1838. Hardwick, J., D.C.L. 5 B, Albany, Piccadilly.
1831. Hardwick, P., R.A., F.S.A. 60, Russell-square.
1847. Hardwicke, Earl of, Wimpole-hall, Arrington, Cambridge.
1839. Hardy, P. 37, Old Jewry; and 10, Victoria-square, Pimlico.
1823. Harford, J. S., D.C.L.
1844. Hargreave, C. J., B.L., Professor of Jurisprudence, University College, London. 69, Chancery-lane.

1835. Harris, J. G., M.A. 25, Chester-street.
1831. Harris, Sir W. S., Knt. Windsor Villas, Plymouth.
1845. Harrison, T. C. 31, York-terrace, Regent's-park.
1825. Harvey, H., F.R.A.S. 59, Regency-square, Brighton.
1835. Harvey, Major-General Sir R. J., C.B., K.T.S., K.S.B., F.S.A. United Service Club; and Mousehold-house, near Norwich.
1827. Harwood, J., M.D., F.L.S. St. Leonard's, Hastings.
1812. Hasted, Rev. H., M.A., F.L.S. Bury, Suffolk.
1821. Haughton, Sir G. C., K.H., M.A., M.R.A.S., &c. 14, Grafton-street.
1834. Hawkins, B., M.D., Col. Reg. Med. Socius. 30, Golden-square.
1821. Hawkins, E., F.S.A., F.L.S. British Museum.
1791. Hawkins, J.
1830. Hawkins, J. H., M.A., F.G.S. Reform Club.
1835. Hawkins, Rev. W., B.L., M.A. 23, Great Marlborough-street.
1814. Hay, R. W., F.S.A.
1818. Heath, G. C. Cambridge.
1843. Heath, J. B., F.S.A. 66, Russell-square.
1846. Henry, T. H. Brick-lane, Spitalfields.
1834. Henry, W. C., M.D. Hatfield, near Ledbury, Herefordshire.
1840. Henwood, W. J. 4, Clarence-street, Penzance.
813. Herschel, Sir J. F. W., Bart, *Vice-President*, D.C.L., M.A., F.R.S.E., Hon. M.R.I.A., F.G.S., M.C.P.S., &c. Collingwood, near Hawkhurst, Kent.
1843. Heygate, J., M.D. College-house, Derby.
1843. Heywood, Sir B., Bart. 9, Hyde-park-gardens.
1839. Heywood, J., F.S.A. Athenæum Club; and Acresfield, Manchester.
1830. Higman, Rev. J. P., M.A., F.G.S., F.R.A.S. Rectory, Fakenham, Norfolk.
1839. Hilton, J. 10, New Broad-street.
1809. Hoare, C., F.S.A. 37, Fleet-street.
1814. Hobhouse, Right Hon. Sir J. C., Bart., M.A. 42, Berkeley-square.
1811. Hoblyn, T., F.L.S. White Barns, Buntingford, Herts.
1841. Hodgkinson, E., F.G.S. 14, Salford-crescent, Manchester.
1831. Hodgson, J. Birmingham.
1839. Hogg, J., M.A., F.L.S., F.C.P.S., M.R.S.L. 12, King's-bench-walk.
1837. Holland, C., M.D. 16, Queen-street, May-fair.
1815. Holland, H., M.D., F.G.S., Coll. Reg. Med. Socius. 24, Brook-street.
1826. Holman, J., Lieut. R.N., F.L.S. Windsor.
1825. Home, Sir E., Bart., Capt. R.N., F.S.A. 4, Queen Anne-street.
1843. Hood, C., F.R.A.S. Earl-street, Blackfriars; and Camberwell.
1847. Hooker, J. D., M.D. West Park, Kew.
1812. Hooker, Sir W. J., K.H., LL.D., F.S.A., F.L.S., F.G.S. Kew.
1834. Hope, Rev. F. W., M.A., F.L.S. 56, Upper Seymour-street.
1837. Hopkins, W., M.A. Fitzwilliam-street, Cambridge.
1841. Hoppus, Rev. J., LL.D., Ph.D. 39, Camden-street, Camden-town.
1834. Horne, J. Clapham-common.
1813. Horner, L., F.R.S.E., &c. Rivermede, Hampton-on-Wick.
1828. Horsfield, T., M.D., F.L.S., F.G.S., M.R.A.S., &c. 43, Markham square.
1843. Hoskins, S. E., M.D. Guernsey.
1821. Howard, L. Bruce-grove, Tottenham; and Ackworth-villa, Pomfret.
1834. Hudson, R., F.G.S. Clapham-common.
1818. Hume, J. 6, Bryanstone-square.
1819. Hunt, Rev. G., M.A., F.S.A. Egg Buckland, near Plymouth.
1837. Hunter, R., F.G.S., F.S.A. Highgate.
1819. Hustler, Rev. J. D., B.D. Euston Rectory, near Thetford, Norfolk.
1839. Hutchinson, Lieut.-col. G., E.I.C.S., Beng. Engineers.
1844. Hyett, W. H. Painswick-house, Painswick.
1838. Hymers, Rev. J., D.D. St. John's College, Cambridge.
1813. Inglis, Sir R. H., Bart., *Vice-President* D.C.L., Trust. Brit. Mus., Pres. Brit. Assoc. for Advanc. of Science, V.P.S.A., F.R.A.S. 7, Bedford-square.
1807. Jacob, W., Inst. Sc. Paris. Corresp. 31, Cadogan-place, Sloane-street.
1845. Jackson, Col. J. 52, Coleshill-street, Pimlico.
1848. James, H., Capt., R.E. Portsmouth.
1826. Jameson, R., F.R.S.E., Hon.M.R.I.A., F.L.S., F.G.S., &c. Edinburgh.
1841. Jeffereys, J. 25 A, Norfolk-crescent, Hyde-park.
1840. Jeffreys, J. G., F.L.S. Norton, near Swansea.
1841. Jenkins, Sir R., G.C.B. India-house; and Bicton-hall, Shrewsbury.
1821. Jennings, The Ven. Archdeacon, D.D., Hampstead-green.

1838. Jervis, T. B., Major E.I.C.E., F.L.S., F.G.S., F.R.A.S. Clifton.
1842. Jesse, J., F.R.A.S., F.L.S. Fordsham, Cheshire.
1842. Johnson, C. W. 14, Gray's-Inn-square.
1836. Johnson, E. J., Captain R.N. 13, Clement's-Inn.
1838. Johnson, Rev. G. H. S., M.A. Oxford.
1846. Johnson, P. N., F.G.S. 38, Mecklenburgh-square.
1810. Johnston, Right Hon. Sir A., Knt., F.S.A., V.P.R.A.S. 19, Great Cumberland-place; and York House, Twickenham.
1845. Johnston, A. R.
1837. Johnston, J. F. W., M.A., F.R.S., Professor of Chemistry and Mineralogy in the University of Durham. Durham.
1846. Jones, H. B., M.A., M. D., Col. Reg. Med. Socius. 30, Lower Grosvenor-st.
1835. Jones, T., F.R.A.S.. 62, Charing-Cross; and West-square.
1844. Jones, T. R., Professor of Comparative Anatomy, King's College. Colney House, Finchley-common.
1840. Jones, T. W. 35, George-street, Hanover-square.
1840. Kater, E., F.G.S., M.R.I.A. Mexborough, Yorkshire.
1846. Kay, J. H., Lieut. R.N.
1838. Kelland, Rev. P., M.A., F.R.S.E., M.C.P.S., Professor of Mathematics in the University of Edinburgh. Wardie, near Edinburgh.
1832. Kidd, J., M.D., F.L.S., F.G.S. Oxford.
1834. Kiernan, F., 30, Manchester-street, Manchester-square.
1824. King, P. P., Captain R.N., F.L.S. Dunheved, New South Wales.
1818. Kirby, Rev. W., M.A., F.L.S., F.G.S. Barham, near Ipswich.
1830. Knowles, Sir F. C., Bart., M.A.
1810. König, C., K.H., Hon. M.R.I.A. British Museum.
1843. Laing, Rev. D. 62, Mornington-road, Regent's-park.
1845. Lankester, E., M.D., F.L.S. 22, Old Burlington-street.
1811. Lansdowne, H., Marquis of, K.G., D.C.L., Trust. Brit. Mus., M.R.S.L. 52, Berkeley-square.
1844. Larcom, T. A., Capt. R.E.
1848. Latham, R.G., M.D. Upper Southwick-street.
1813. Lawrence, W. 18, Whitehall-place.
1840. Lawson, H. 7, Lansdowne-crescent, Bath.
1815. Leake, Lieut.-Colonel W. M., M.R.S.L., &c. 50, Queen Anne-street.
1843. Le Couteur, Col. J. Belle Vue, Jersey.
1831. Lee, J., LL.D., F.R.A.S. 5, College, Doctors'-commons.
1830. Lee, R., M.D., Coll. Reg. Med. Socius. 4, Saville-row.
1820. Lefevre, J. G. S., M.A., Vice-Chan. of the Univ. of London. Board of Trade.
1848. Lefroy, J. H., Capt. R.A. Canada.
1817. Legh, T., D.C.L. Lyme-park, Cheshire.
1822. Lemon, Sir C., Bart. 46, Charles-street, Berkeley-square.
1836. Lewis, T. L., Capt. R.E., F.G.S. Ibsley-cottage, Exeter.
1811. Lincoln, J. K., Lord Bishop of. Cambridge.
1828. Lindley, J., Phil. D., F.L.S., &c. 21, Regent-street.
1832. Lister, J. J. Upton, Essex.
1836. Llewelyn, J. D., F.L.S. Penllegare, Glamorgan.
1818. Lloyd, E., Captain R.N. United Service Club.
1830. Lloyd, Lieut.-Col. J. A., Surveyor-General. Port Louis, Mauritius.
1834. Lloyd, Rev. W. F., M.A. Missenden, Bucks.
1836. Lloyd, Rev. H., M.A., M.R.I.A. Dublin.
1838. Locke, J. 6, Chester-terrace, Regent's-park.
1811. Locker, E. H., F.S.A.
1810. Lonsdale, W., Earl of. 14, Carlton-terrace; and Lowther Castle near Penrith.
1841. Lovelace, W. K., Earl of. East Horsley-park, Ripley, Surrey.
1834. Lowe, G. 39, Finsbury-circus.
1829. Lubbock, Sir J. W., Bart., M.A., F.L.S., F.R.A.S., M.R.A.S. 23, St. James's-place.
1826. Lyell, C., jun., M.A., F.L.S., F.G.S. 11, Harley-street, Cavendish-square.
1826. Lyndhurst, J. S., Lord, D.C.L. 25, George-street, Hanover-square.
1840. Littleton, G. W., Lord. 17, St. James's-pl.; and Hagley-park, Worcestersh.
1816. MacGrigor, Sir J., Bart., F.R.S.E., Coll. Reg. Med. Socius. 3, Harley-st.
1815. Mackenzie, Sir G. S., Bart., F.R.S.E. Coul, Ross-shire.
1827. Mackinnon, W. A., M.A., F.S.A., F.G.S. 4, Hyde-park-place.
1831. Maclear, T., F.R.A.S., Astronomer Royal at the Cape of Good Hope.
1839. Mackmurdo, G. W. St. Thomas's Hospital; and 7, New Broad-street.

1838. Macneill, Sir J., F.R.A.S., M.R.I.A. 28, Rutland-square, Dublin.
1848. M'William, J. O., M.D. Trinity-square, Tower-hill.
1832. Madden, Sir F., K.H., Hon. M.R.I.A., F.S.A., &c. British Museum.
1817. Maddy, Rev. J., D.D., F.S.A., F.R.A.S. Somertown, Bury St. Edmund's.
1819. Magrath, Sir G., K.H., M.D., M.R.I.A., F.L.S., F.G.S. Plymouth.
1827. Mahon, P. H., Viscount, D.C.L., P.S.A. 41, Grosvenor-place.
1847. Maitland, J. G., M.A. 8, New-square, Lincoln's-Inn.
1839. Maitland, Rev. S. R. Lambeth-palace.
1839. Maitland, E. F., F.S.A. Henley-on-Thames, Oxfordshire.
1831. Majendie, A., F.G.S. Hedingham-castle, Castle Hedingham, Essex.
1831. Manby, G. W., Capt. R.N. Yarmouth.
1825. Mangles, J., Capt. R.N. 66, Cambridge-terrace, Edgeware-road.
1825. Mantell, G. A., LL.D., F.L.S., F.G.S., &c. 19, Chester-square, Pimlico.
1836. Marcet, F. Geneva.
1816. Markland, J. H., F.S.A. Bath.
1845. Martin, J. R., F.R.M. & C.S., M.R.A.S. 71A, Grosvenor-street.
1823. Maskelyne, A. M. S., M.A. Basset Down-house, Swindon.
1846. Matheson, J. 13, Cleveland-row.
1832. Mauley, W. F. S., Lord de. 24, George-street, Hanover-square.
1829. Maxwell, Sir J., Bart. Pollock, Renfrewshire.
1827. Mayo, Rev. C., B.D., F.S.A. Colesgrove, Hertfordshire.
1835. Mayo, T., M.D., Coll. Reg. Med. Socius. 56, Wimpole-street.
1841. Melvill, J. C. East-India-house.
1817. Melville, R., Viscount, K.T., F.R.A.S. 3, Somerset-place.
1838. Merewether, Very Rev. J., D.D., Dean of Hereford, F.S.A. Hereford.
1843. Miers, J. Temple-lodge, Hammersmith.
1843. Miller, J. Monastery-cottage, East-India-road.
1827. Miller, Lieut.-Col. G., C.B.
1845. Miller, W. A., M.D., Professor of Chemistry. King's College, London.
1838. Miller, W. H., M.A., Professor of Mineralogy. Cambridge.
1836. Minto, G. E. M. K., Earl of, F.R.A.S. Minto-castle, Roxburghshire.
1835. Molesworth, Sir W., Bart. 1, Lowndes-square.
1841. Monteagle (of Brandon), T., Lord, F.S.A. 37, Lower Brook-street.
1845. Monteith, Maj.-Gen. W.
1836. Montefiore, Sir M., Knt. 7, Grosvenor-gate, Park-lane.
1835. Moore, G., F.S.A., F.L.S. 64, Lincoln's-Inn-fields.
1846. Moore, Major J. A., F.S.A. 23, Park-crescent, Portland-place.
1827. Moreau, C., Acadd. Reg. Divion., Burd., et Masil., Socius. Paris.
1835. Morgan, A. 26, New Bridge-street, Blackfriars.
1832. Morgan, O. S., M.A., F.S.A. 70, Pall-mall.
1819. Morier, J. 22, Charles-street, Berkeley-square.
1842. Morison, Maj.-Gen. W., C.B., F.R.S.E. Oriental-club; or 16, Saville-row.
1831. Morris, J. C. 9, Upper Hyde-park-street.
1839. Moseley, Rev. H., M.A. Wandsworth.
1830. Moss, J. W., M.B. Dudley.
1847. Mountcashel, S., Earl of. Moore-park, Kilworth, Cork.
1822. Mudge, R. Z., Lieut.-Col. R.E. Beechwood, Plympton, Devon.
1826. Murchison, Sir R. I., G.C.St.S., M.A., V.P.G.S., F.L.S., &c. 16, Belgrave-sq.
1826. Mylne, W. C., F.R.A.S. New River-head.
1820. Napier, H., Capt. R.N. Cadogan-place.
1840. Narrien, J., F.R.A.S., Professor of Mathematics in the Royal Military College, Sandhurst. Sandhurst.
1846. Neilson, J. B. Glasgow.
1842. Newbold, T. J., Lieut. E.I.C.S. Madras.
1846. Newport, G., F.L.S., F.R.C.S., &c. 30, Southwick-street, Oxford-terrace.
1833. Nolan, Rev. F., LL.D., M.R.S.L. Prittlewell, Essex.
1842. Norfolk, The Most Noble H., Duke of. 1, Hyde Park-place.
1830. Northampton, S. J. A., Marquis of, F.S.A., Hon. M.R.I.A., F.L.S., F.G.S., &c. 145, Piccadilly.
1823. Northumberland, A., Duke of, F.S.A. Northumberland-house, Strand.
1840. Norwich, E. S., Lord Bishop of, President of the Linnean Society. 38, Lower Brook-street.
1826. Ogle, J. A., M.D., F.R.A.S. Lord Lichfield's and Aldrich's Professor of Medicine, Oxford.
1848. Oldham, T. Trinity College, Dublin.
1835. Oliveira, B., F.S.A. 8, Upper Hyde Park-street.

1824. Orford, H., Earl of. White's Club; and Wolterton-park, Norfolk.
1819. Ormerod, G., D.C.L., F.S.A., F.G.S. Sudbury-park, Gloucestershire.
1843. O'Shaughnessy, W. B., M.D. Calcutta.
1836. Outram, B. F., M.D., F.R.G.S. 1, Hanover-square.
1834. Owen, R., M.D., LL.D., F.L.S., V.P.G.S., &c. Royal College of Surgeons, Lincoln's-Inn-fields.
1845. Oxford, S. W., Lord Bishop of. 61, Eaton-place.
1821. Palgrave, Sir F., K.H., Deputy Keeper of Her Majesty's Records. Rolls-yard, Chancery-lane; and Hampstead-green.
1821. Paris, J. A., M.D., Pres. of the Royal College of Physicians. 27, Dover-st.
1824. Parish, Sir W., K.C.H., F.S.A., F.G.S.
1815. Parker, T. L., F.S.A. 34, Mount-street.
1812. Parry, C. H., M.D. Bath.
1821. Parry, Sir W. E., Knt., D.C.L., Capt. R.N., Hon. M.R.I.A., F.R.A.S., &c., Superintendent of Haslar Hospital. Gosport.
1837. Partridge, R. 17, New-street, Spring-gardens.
1816. Pasley, Maj.-Gen. C. W., R.E., C.B., F.R.A.S., F.G.S. 12, Norfolk-crescent.
1818. Peacock, Very Rev. G., D.D., Dean of Ely, F.G.S., F.R.A.S. Deanery, Ely.
1833. Pearson, Sir E., K.H., M.A. 5, Gloucester-terrace, Regent's-park.
1819. Pearson, Rev. W., LL.D., F.R.A.S. South Kilworth, Northamptonshire.
1826. Pearson, Sir W., Knt., M.D.
1832. Pechell, Sir S. J. B., Bart., Capt. R.N. 27, Hill-street, Berkeley-square.
1822. Peel, Right Hon. Sir R., Bart., D.C.L., F.S.A., &c. Whitehall-gardens.
1835. Pelly, Sir J. H., Bart. Trinity-house.
1813. Pemberton, G. Bainbridge Holme, Durham; and 20, Edgeware-road.
1837. Pendarves, E. W. W., M.A., F.G.S. 36, Eaton-place, Belgrave-square.
1824. Penn, R. 6, Whitehall.
1808. Pepys, W. H., F.L.S. 22, Poultry.
1847. Percy, J., M.D. Birmingham.
1838. Pereira, J., M.D., F.L.S. 47, Finsbury-square.
1807. Petit, L. H., M.A., F.S.A., F.L.S., F.G.S., F.R.A.S., M.R.S.L. 9, New-square, Lincoln's-Inn.
1817. Petre, W. F. H., Lord. 3, Mansfield-street; and Thorndon-hall, Essex.
1837. Pettigrew, T. J., F.S.A., M.R.A.S., &c. 8, Saville-row.
1826. Philip, A. P. W., M.D., Coll. Reg. Med. Socius, F.R.S.E.
1840. Phillimore, J., LL.D. 15, College, Doctor's-commons; and 22, Portman-st.
1819. Phillipps, Sir T., Bart., M.A., F.S.A., F.G.S., Hon. M.R.S.L. Middle-hill, Worcestershire.
1834. Phillips, B. 17, Wimpole-street, Cavendish-square.
1834. Phillips, J., F.G.S. York.
1822. Phillips, R., F.R.S.E. 6, Craig's-court, Charing-cross; and Camberwell.
1846. Playfair, L. Hammersmith.
1847. Plowden, W. H. C., F.R.A.S. 8, Devonshire-place.
1839. Pole, W., M.A. 66, Brook-street.
1816. Pollock, Right Hon. Sir F., Chief Baron of the Exchequer, K.H., M.A., F.S.A., F.G.S. Queen-square-house, Guildford-street.
1843. Porrett, R. Ordnance-office, Tower.
1838. Porter, G. R., M.R.A.S. Board of Trade, Whitehall.
1837. Portlock, J. E., Capt. R.E., F.G.S. Cork.
1824. Powell, Rev. B., M.A., F.R.A.S., Savilian Professor of Geometry. Oxford.
1842. Pratt, S. P., F.L.S., F.G.S. 55, Lincoln's-Inn-fields; and Bath.
1827. Prichard, J. C., M.D., Hon. M.R.I.A. 1, Woburn-place, Russell-square.
1840. Pritchard, Rev. C., M.A. Clapham.
1819. Prout, W., M.D. 40, Sackville-street.
1830. Pusey, P. 35, Grosvenor-square; and Pusey-house, Berks.
1844. Quain, R., Prof. of Anatomy, University Coll., London. 23, Keppel-street.
1814. Rashleigh, W., F.L.S. 3, Cumberland-terrace, Regent's-park.
1837. Rastrick, J. U. 46, Eaton-square.
1838. Reade, Rev. J. B., M.A. Stone Vicarage, Aylesbury.
1843. Rees, G. O., M.D., F.G.S. 59, Guildford-street, Russell-square.
1817. Reeves, J., F.L.S., F.R.A.S. Clapham.
1834. Reeves, J. R., F.L.S. Clapham.
1839. Reid, Lieut.-Col. W., C.B., R.E. Governor of Bermuda.
1843. Rendel, J. M. 8, Great George-street, Westminster.
1822. Rennie, G., M.R.I.A. 21, Whitehall-place.
1823. Rennie, Sir J., Knt., Pres. of the Inst. of Civil Engineers. 15, Whitehall-pl.

1845. Rennie, J. 6, Whitehall-place.
1825. Richardson, Sir J., Knt., M.D., F.L.S. Haslar-hospital, Gosport.
1840. Richmond, C. G. L., Duke of, K.G. 51, Portland-place; and Goodwood.
1836. Ricketts, C. M., F.G.S. Lima.
1842. Riddell, C. J. B., Capt. R.A. Woolwich.
1839. Rigg, R. Greenford, Middlesex.
1838. Ripon, F. J., Earl of. Carlton-gardens.
1836. Robertson, A., M.D. Northampton.
1796. Rogers, S., F.S.A. 22, St. James's-place.
1839. Rogers, J., jun. Vine-lodge, near Sevenoaks, Kent.
1815. Roget, P. M., M.D., F.G.S., F.R.A.S., V.P.S.A., &c. 18, Up. Bedford-place.
1844. Ronalds, F. Chiswick.
1831. Ros, Hon. I. F. F. de, Capt.R.N., F.R.A.S.
1834. Rose, Sir G., Knt. 4, Hyde Park-gardens.
1819. Rosebery, A. J., Earl of, K.T. 139, Piccadilly.
1822. Ross, Capt. D. India.
1828. Ross, Sir J. C., Knt., Capt. R.N., D.C.L., F.L.S., F.R.A.S., &c. Aston-house, Aylesbury.
1831. Rosse, W., Earl of, F.R.A.S. Birr-castle, King's-county, Ireland.
1839. Roupell, G. L., M.D. 15, Welbeck-street.
1837. Royle, J. F., M.D., F.L.S., F.G.S., F.R.A.S. 4, Bulstrode-st., Manchester-sq.
1847. Rudge, E. J., M.A., F.S.A. 52, Upper Harley-street.
1821. Russell, J. W., D.C.L., F.S.A., F.L.S., F.G.S. Ilam-hall, Staffordshire.
1847. Russell, Lord J. Chesham-house, Belgrave-square.
1818. Sabine, Lieut.-Col. E., R.A., F.R.A.S. Athenæum Club; and Woolwich.
1832. Sandford, E. A. Nynehead, Somerset.
1833. Saunders, Rev. A. P., D.D. Charterhouse-school.
1822. Sawbridge, H. B.
1824. Scoresby, Rev. W., D.D., F.R.S.E., Instit. Reg. Sc. Paris. Corr. Bradford.
1800. Scott, J. C. Edinburgh.
1826. Scrope, G. P., F.G.S. 13, Belgrave-square; and Castle Combe, Wiltshire.
1824. Scudamore, Sir C., Knt., M.D. 6, Wimpole-street.
1821. Sedgwick, Rev. A., M.A., Hon. M.R.I.A., F.G.S., F.R.A.S. Cambridge.
1831. Selkirk, T. J., Earl of. St. Mary's Isle, Kircudbright.
1841. Seymour, E. J., M.D., &c. 13, Charles-street, Berkeley-square.
1840. Sharp, W., F.G.S., F.R.A.S. Rugby.
1839. Sharpey, W., M.D., F.R.S.E. 35, Gloucester-crescent, Regent's-park.
1831. Shee, Sir M. A., Knt., President of the Royal Acad. 32, Cavendish square.
1830. Sheepshanks, Rev. R., M.A., F.G.S., F.R.A.S. 14, London-road, Reading.
1824. Shuckburg, Sir F., Bart. Pavilion, Chelsea; Shuckburg-pk., Warwickshire.
1841. Siever, R. W. 12A, Henrietta-street, Cavendish-square.
1845. Simon, J., Demonstrator of Anatomy, King's College. 3, Lancaster place.
1847. Simpkinson, Sir J. A. F., Knt., M.A., Q.C., F.S.A. 21, Bedford-place.
1837. Skey, F. C. 13, Grosvenor-street.
1841. Smee, A. 7, Finsbury-circus.
1824. Smith, Lieut.-Col. C. H., F.L.S. Plymouth.
1830. Smith, J., F.R.S.E. Jordan-hill, near Glasgow.
1837. Smith, J. T., Capt. Madras Engineers. Madras.
1840. Smith, Rev. J. P., D.D., LL.D., F.G.S., &c. Homerton, Middlesex.
1819. Smith, J., F.L.S. 2, Gray's-inn-place.
1805. Smith, Sir William, Knt.
1841. Smith, Sir J. M. F., Lieut.-Colonel R.E. Chatham.
1826. Smyth, W. H., Capt. R.N., K.S.F., D.C.L., Hon. M.R.I.A., Director S.A., V.P.R.A.S., V.P.R.C. 3, Cheyne-walk, Chelsea.
1843. Solly, E., Professor of Chemistry, H. S., &c. 33, Bedford-place, Russell-sq.
1807. Solly, R. H., M.A., F.S.A., F.L.S., F.G.S. 48, Great Ormond-street.
1837. Solly, S. 1, St. Helen's-place, Bishopsgate-street.
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Clerke, Major T. H. S., K.H., F.R.S. 4, Brompton-grove.
Cliffe, J. E., M.D. Cuijaba, Brazils.
Clutterbuck, R. Bevis-hill, Southmptn.
Colbeck, T.
Colby, T., Maj.-Gen. R.E., LL.D., F.R.S. L. & E., M.R.I.A. Ordnance Map-office, Southampton.
Colclough, C. Boteler-ho., Cheltenham.
Colebrooke, Sir T. E., Bart., M.P. 18, Park-lane.
Coles, H. Cheltenham.
Coles, J. Stonehouse, Devonshire.
Collard, T. W. St. George's-place, Canterbury.
Collet, T.
Collier, C., M.D., F.R.S. 20, Fitzroy-sq.
Collings, W. T. Trinity-college, Camb.
Colthurst, J. Gateshead, Newcastle.
Conybeare, J. C. 7, Chancery-lane.
Cooke, P. D., F.L.S. & H.S. Llynegrin, Mold.
Cooke, Rev. R. B. Wheldrake Rectory, Escrick.
Copland, A., F.H.S.
Copland, W. Edinburgh.
Cox, J. Wisbeach.
Cox, T., M.D. 2, Stanhope-place.
Coxe, L. S. 4, Brunswick-place.
Craig, J. Glasgow.
Crane, G. Ynisceedwyn Iron-works, Swansea.
Craufurd, W. P. 56, Upper Berkeley-st.
Crawshay, W., jun. Cyfarthfa Iron-works, Merthyr-Tydvil.
Crichton, Sir A., K.S.W., M.D., F.R.S. & L.S. The Grove, Seal Chart, Sevenoaks.
Crichton, A.
Crompton C. 10, Endsleigh-street.
Cubitt, W. Gray's-inn-lane.
Cubitt, W., F.R.S., M.R.I.A. 6, Great George-street.
Cumming, Rev. J., M.A., F.R.S. Cambridge.
Cumming, Rev. J. G., M.A. Isle of Man.
Cumming, Sir W. G., Bart. Altyre, nr. Forres.
Cunliffe, B., jun.
Cunningham, G.
Cunningham, J. 29, Seel-street, Lpool.
Cure, C. 2, Devonshire-place.
Currie, Rev. C., M.A.
Daniel, Rev. R., M.A., F.S.A. & L.S. Combs, Suffolk.
Dansey, Rev. W., M.B. Donhead, St. Andrew, Wilts.
Darwin, C., M.A., F.R.S. Down, Kent.
Daubeny, C. G. B., M.D., F.R.S. & L.S., H.M.R.I.A. Oxford.
Daubeny, R. H.
Dann, R., M.D. Chanonry, Old Aberdn.
Davey, R. Redruth.
Davis, J. E. 1, Elm-court, Temple.
Dawes, J. S. Westbromwich.
Dawes, M. Westbrook.
Dawes, Rev. R., M.A.
Dawson, G. Edgbaston, Birmingham.
Dawson, R., Capt. R.E. North End, Fulham.
Day, Rev. J. D., B.A. Vicarage, Ellismore.
Deacon, J. H. Holwell-house, Tavistock.
Deck, Mr. I. Cambridge.
De la Beche, Sir H. T., F.R.S. & L.S.
De Mauley, W. F. S., Lord, F.R.S. 21, St. James's-place.
Dennes, G. E., F.L.S. Grecian-chamb., Temple.
Dennys, N. 3, Ampthill-square.
De Salis, W. F., M.A. Australia.
Devonshire, W. S., Duke of, K.G., K.A., D.C.L., F.H.S. Piccadilly.
Dickinson, J. 4, Furnival's-inn.
Dickinson, J. Nithsdale, Ayrshire.
Dickson, J.
Dikes, W. H. Wakefield.
Dillwyn, L. L., F.L.S. Burrows-lodge.
Dillwyn, L. W., F.R.S. & L.S. Sketty Hall, Swansea.
Dixon, F. Worthing.
Dobinson, J. Egham-lodge.
Dorrington, J., M.A., F.L.S. Linton, Cambridgeshire.
Downing, F. The Priory, Dudley.
Drummond, Capt. H., B.A. India.
Duncan, P., M.A. Bath.
Dundas, Lieut.-Col., C.B., R.A. Woolwh.
Earle, C. Liverpool.
Eaton, J. Bedford.
Edmonston, Rev. J. N. Romney, Kent.
Edwards, W.
Egerton, Sir P. de Malpas G., Bart., M.P., F.R.S. Oulton-park.
Egerton, Rev. T. Dunnington Rectory.
Egerton, Rev. W. H. Whitechrch. Salop.
Eliot, Lieut.-Col. W. G. Hastings.
Ellis, F. J., B.A.
Ellis, Right Hon. Sir H., F.R.S. Kingston-on-Thames.

Ellesmere, Earl of. 18, Belgrave-square.
Elphinstone, Sir H., M.A., F.R.S. Bonn.
Elwin, H. Sydney.
Ely, Very Rev. the Dean of, D.D., V.P.R.S. Deanery, Ely.
Emerson, A.L., M.D.
Engleand, Rev. T., M.A. Parkhurst.
Enniskillen, W. W., Earl of, D.C.L., F.R.S. Florence-court.
Enys, J. S., Enys.
Erle, Rev. C., M.A. Hardwicke-rectory, Aylesbury.
Esmead, G. F.
Essex, A., Earl of.
Evans, J. 32, Hertford-street.
Evans, Rev. R., M.A.
Evans, W., M.P. Park-house.
Everest, G., Lieut.-Col. Hon. E.I.C.S., F.R.S. Winkfield.
Everest, Rev. R.
Ewer, W., F.R.S. 8, Portland-place.
Eyre, G. E. Warren's Stony Cross.
Eyton, T. C., F.L.S. Eyton, Wellington.
Falconer, H., A.M., M.D., F.R.S.
Falconer, T. Wootton, Hampshire.
Faraday, M., D.C.L., F.R.S. Royal Institution, Albemarle-street.
Farrer, J. W. 7, John-street.
Faulkner, C. Museum, Deddington.
Fearn, S. W. Derby.
Fearon, J. P. 34, Great George-street.
Featherstonhaugh, G. W., F.R.S.
Fennell, Rev. R. Worthing.
Fenwick, T. Newcastle-upon-Tyne.
Finch, F.
Fisher, J. Hackney.
Fisher, J. C. Wood-hall, Cockermouth.
Fisher, Rev. J. H., M.A. Kirkby Lonsdale.
Fitch, R. Norwich.
Fitton, W. H., M.D., F.R.S. & L.S. 33, Upper Harley-street.
Fitzwilliam, C. W., Earl, F.R.S., S.A., & H.S. Mortimer-house.
Fletcher, T. W., F.R.S., P.S.A. Dudley.
Floresi, D. Mexico.
Floyer, J., B.A. Stafford.
Forbes, E., F.R.S.
Forbes, J. D., F.R.S.
Forbes, J. H. Merry Oak, Southamp.
Forbes, J., M.D., F.R.S. 12, Old Burlington-street.
Forbes, W. N., F.R.S. Blackford, Aberdeen.
Forster, F. Bangor, South Wales.
Forster, W.
Foster, J. Stourton-castle, Staffordsh.
Fothergill, R. Lowbridge-ho., Kendal.
Fowler, J. 2, Queen's-square-place.
Fox, G. C., F.H.S. Grove-hill, Falmth.
Franklin, Sir J., Capt. R.N., K.C.H., D.C.L., F.R.S. & L.S.
Fraser, J. B., M.R.A.S. Monzack.
Fraser, C. 38, Conduit-street.
Freeland, H. W. 19, Duke-street.
Frere, E. Bitton.
Freshfield, J. W., F.R.S. Bank-st.
Galland, B. H.
Galton, Lieut. D., R.E. 29, Duke-street.
Gaskell, J. D.
George, J. D. 32, Old Burlington-st.
Gesne, A., M.D. St. John's, N. Brunsw.
Gibson, T. F. 31, Westbourne-terrace.
Gibson, W. S. Newcastle-upon-Tyne.
Gilbert, J. D., M.A., F.R.S. Eastbourne.
Gilbert, Rev. N. Antigua.
Gladdish, W. Gravesend.
Goldsmid, Sir I. L., Bart., F.R.S., S.A. & L.S. Park-lodge.
Goodhall, H. E. 4, Laurence Pountney-pl.
Gordon, L. D. B. Glasgow.
Gore, M. Barrow-court, Bristol.
Gowen, J. R., F.H.S.
Gower, A. L. 31, Finsbury-square.
Graham, T., F.R.S. 9, Torrington-sq.
Grant, C. W., Capt. B.E. India.
Grant, Sir J. M., Bart. Ballindalloch.
Grant, R. E., M.D., F.R.S.L. & E., & L.S. 10, Seymour-place North.
Grantham, R. B. 2, Robert-street.
Granville, A. B., M.D., F.R.S., M.R.A.S. 100, Piccadilly.
Gray, W., jun. York.
Green, J. H., F.R.S. Hadley.
Greenough, G.B., F.R.S., L.S., & H.S., M.R.A.S. Regent's-park.
Greg, R. H. Manchester.
Grimin, T.
Griffith, J. 16, Finsbury-place South.
Griffith, R.C., M.D. 10, Gower-st.
Griffith, R. J. Dublin.
Grote, A. Clapham-park.
Grote, G., M.A.
Guest, Sir J. J., Bart., M.P., F.R.S. & H.S. 8, Spring-gardens.
Guise, W. V. Elmore-court, Gloucester.
Gurdon, J. Ryde, Isle of Wight.
Gwatkin, Rev. R., B.D. Barrow-on-the Soar.
Hale, R.B., M.P. 18, Bolton-street.
Hall, J. 40, Brewer-street.
Hall, Sir J., Bart., F.R.S. 6, Lowndes-square.
Hallam, H., M.A., F.R.S., & V.P.S.A. 24, Wilton-crescent.
Hallam, H. F. 24, Wilton-crescent.
Hambrough, A. Isle of Wight.
Hamilton, C. W., M.R.I.A. 1, Denmark-street, Dublin.
Hamilton, Rev. H. P., M.A., F.R.S., L. & E. Wath, Yorkshire.
Hamilton, W. J. 14, Chesham-place.
Hamond, W. P.
Hankey, J. A., F.L.S. 36, Brook-street.
Hankinson, Rev. R. Blney-lodge, Lynn.
Harcourt, E. V. V. Uxley-hall, Scarbro'.
Harcourt, G. G., M.P. 24, St. James's-pl.
Harcourt, Rev. W. V. V., M.A., F.R.S. Wheldrake, York.
Harding, W., Major. Tiverton.
Hardwick, P., F.R.S. & S.A. 60, Russell-square.

Hare, J. jun. Bath.
Hare, The Ven. Archdeacon J. C., M.A. Hurstmonceaux, Sussex.
Harford, J. S., D.C.L., F.R.S. Blaise-castle, Bristol.
Harris, Hon. C.
Harris, W.
Harris, W. Charing, Kent.
Harrison, T., F.H.S. 36, Alpha-road.
Harrison, T., F.L.S. & H.S. Treas.-ch.
Hartwell, F.
Hastie, J. 1, Grove-hill-terrace.
Hastings, C., M.D. Worcester.
Hawes, W. 17, Montague-place.
Hawkins, J. H., F.R.S. 16, Suffolk-st.
Hawkins, T.
Hawkshaw, J. Islington-house, Manch.
Heath, J. M., F.L.S. Madras.
Heathfield, R., jun. 1, New-sq.
Henderson, G. M. 54, Queen Anne-st.
Henry, W. C., M.D., F.R.S. Manchest.
Henslow, Rev. J. S., M.A., F.L.S. Hitcham, Suffolk.
Henwood, W. J., F.R.S. Penzance.
Herbert, J.M. The Priory, Bodmin.
Herschel, Sir J. F. W., Bart., D.C.L., K.C.H., F.R.S.L. Collingwood.
Hertzog, W. F. Cape of Good Hope.
Hervey, Lord C.
Heywood, J., M.P., F.R.S. 48, Dover-st.
Hibbert-Ware, S., M.D., F.R.S.E. Hale Barnes-green, Cheshire.
Higman, Rev. J. P., M.A., F.R.S. Fakenham, Norfolk.
Hill, A. Plymouth, Merthyr Tydvil.
Hill, Rev. E., B.A. Christ-church, Oxf.
Hill, G.
Hincks, Rev. T. D., LL.D. Belfast.
Hincks, T. C. Breckenbrough, Thirsk.
Hodgkinson, E., F.R.S. 14, Crescent, Manchester.
Holbech, W. Farnborough.
Holl, W. Edgbaston.
Holland, H., M.D., F.R.S. 25, Lower Brook-street.
Hollier, R. Maze Hill, Greenwich.
Hony, Rev. W. E., M.A. Baverstock.
Hooker, J. J., M.D., F.R.S. Kew.
Hope, H. T. 1, Mansfield-street.
Hopkins, E., C.E.
Hopkins, W., M.A., F.R.S. Fitzwilliam-street, Cambridge.
Hore, Rev. W. S., M.A., F.L.S. Stoke.
Horne, E., F.L.S. Florence.
Horner, L., F.R.S.L. & E. Rivernede, Middlesex.
Horsfield, T., M.D., F.R.S., V.P.L.S. Markham-square, Chelsea.
Hudson, R., F.R.S. Clapham-common.
Hughes, S. 8, Duke-street.
Hull, W. D. 15, Hatch-street, Dublin.
Hulton, W. Hulton.
Humble, W., M.D.
Hunt, Z. D. Aylesbury.
Hunter, R., F.R.S. & S.A., M.R.A.S. Highgate.
Hunter, W. P.
Hutton, T., Capt. Bng. Army, Mascoovee.
Hutton, R., M.R.I.A. Putney-park.
Hutton, T. Summer-hill, Dublin.
Hutton, W., F.R.S. Newcas.-up.-Tyne.
Hymers, Rev. J., D.D., F.R.S. Cambridg.
I'Anson, E., jun. 14, Laurence Pountney-lane.
Ibbetson, L. L. B. Clifton-ho., Old Bramp.
Image, Rev. T. Whepstead, Suffolk.
Ingham, R., M.A. 13, King's-bench-walk.
Irvine, Rev. A. St. Margaret's, Leicest.
Jack, A., Capt. B.N.I. India.
Jackson, A. W. Tunbridge-wells.
James, H., Capt. R.E. 30, Norfolk-cres.
James, Rev. E. Alton-vicarage.
Jameson, R., F.R.S. Edinburgh.
Jardine, J., Civil Engineer. Edinburgh.
Jeffreys, J., F.R.S. 25A, Norfolk-cresc.
Jenkyns, Rev. T. W., D.D. Torrington-sq.
Jenkyns, Rev. H. Colchester.
Jennings, F. M., M.R.I.A. Brown-st., Cork.
Jenyns, Rev. L., M.A., F.L.S. Swaffham, Bulbeck.
Jervis, T. B., Major, F.R.S. & L.S. Clifton, Bristol.
Jerwood, J., A.M. 8, Dix's-field, Exeter.
Johnson, P. N. 38, Mecklenburgh-sq.
Johnson, W. Grosvenor Granite-wharf.
Johnston, J. F. W., M.A., F.R.S. Durham.
Johnston, A. K. Edinburgh.
Johnstone, E., M.A.
Johnstone, Sir J. V. B., Bart., M.P. 27, Grosvenor-square.
Jones, T., Capt. R.N., M.P.
Joyce, T. Bath.
Jukes, J. B., B.A.
Kater, E., F.R.S., M.R.A.S. 1, Somers-pl.
Kebaart, E., M.D. Army Medical Staff.
Kell, W. G. 43, Bedford-row.
Keogh, C.
Kenyon, J. 40, York-terrace.
Kerry, Right Hon. M. F., the Knight of.
Kidd, J., M.D., F.R.S. & L.S. Oxford.
Killaly, R. G. Mexico.
King, J., M.A. Cambridge.
Kirby, Rev. W., M.A., F.R.S. & L.S. Barham, Ipswich.
Kirshaw, J. W. Bennett's-hill, Birm.
Laing, T. J. Hillingdon Grange, Midd.
Lambert, J. Blackheath-park.
Lampet, Rev. B.E., M.A. Great Bardfield.
Llandaff, the Very Rev. the Dean of.
Lang, G. H. 11, Park-street.
Langdale, H., Lord. Templeton-hall, Richampton.
Lansdowne, H., Marq. of, D.C.L., F.R.S., L. & E., & H.S. Lansdowne-house.
Larkin, N. J. 36, Green-walk.
Lashmar, C., M.D. Croydon.
Laurance, Mr. J. Elton, Stilton.
Laverack, W. T. Swinefleet, Goole.

Isaake, G. Swan-river.
Lee, J., LL.D., F.R.S. 5, College, Doctors'-commons.
Lefevre, Right Hon. C. S., M.P., F.H.S. 71, Eaton-square.
Lefevre, H. F. S. 44, Eaton-place.
Legh, G. C., M.P.
Lemon, Sir C., Bart., M.P., F.R.S. & H.S. 46, Charles-street.
Lewellyn, W. Pontypool.
Lewis, W.A., B.A. Wolverhampton.
Lewis, Sir T. F., Bart. 21, Grafton-st.
Lincoln, Earl of, M.P. 19, Whitehall-pl.
Lindley, W. 8, Adelphi-terrace.
Lingard, J. R. Stockport.
Lingwood, R. M., M.A., F.L.S. Lyston-house, Herefordshire.
Lloyd, E. 34, Bedford-place.
Lloyd, G., M.D. Stank-hill, Warwick.
Loch, G. 12, Albemarle-street.
Loch, J., M.P. 12, Albemarle-street.
Lodge, Rev. J., M.A. Stand-ho., Newc.
Loftus, W. K.
Logan, W. E.
Logan, J. R. Singapore.
Long, W. Saxmundham-hall.
Longlands, Rev. W.D. Truro.
Longman, T. 2, Hanover-terrace.
Lonsdale, W.
Looney, F. Manchester.
Lowe, G., F.R.S. 39, Finsbury-circus.
Loyd, S. J. 22, Norfolk-street.
Lubbock, Sir J. W., F.R.S. 28, St. James's-place.
Lyell, Sir C., M.A., F.R.S. & L.S. 11, Harley-street.
Lyon, Rev. R., D.D. Sherborne.
MacAdam, J. R. Acad. Inst., Belfast.
Macbride, J. D., D.C.L. Oxford.
M'Clelland, J. Bengal Medical Service.
M'Dermott, G. A. Chesterton-hall, Newcastle-under-Lyne.
M'Donald, W., M.D., F.R.S.E. & L.S. America.
Macdonnell, J. Club-chamb., Regt.-st.
Macintosh, Col. A. F., K.H. Antermony, Glasgow.
Mackay, R. W., M.A.
Mackenzie, C., F.R.S. & L.S.
Mackeson, H. B. Hythe.
Maclaren, C., F.R.S.E. Northumberland-street, Edinburgh.
MacLauchlan, H.
Magrath, Sir G., M.D., K.H., F.R.S. Plymouth.
Majendie, A., F.R.S.
Malcolm, N., F.H.S. 7, Gt.Stanhope-st.
Manby, C. 25, Great George-street.
Manchester, J. P. L., D.D., Lord Bishop of, F.R.G.S.
Mantell, G. A., LL.D., F.R.S. & L.S. 19, Chester-square.
Marshall, A. Headingley, Leeds.
Marshall, J. G. Headingley, Leeds.
Marshall, W., M.P. 67, Eaton-square.
Martin, J. Swansea.
Martin, P. J. Pulborough, Sussex.
Matheson, J., M.P., F.R.S., F.R.G.S. 13, Cleveland-row.
Matthews, W. Greenhill, Dudley.
Mayo, H. Cheshunt, Herts.
Meeson, R. Grays, Essex.
Mercer, G. 52, Queen Anne-street.
Meyer, C. P.
Middleton, J.
Miller, W. H., M.A., F.R.S. Cambridge.
Milne, D., F.R.S.E. Edinburgh.
Milne, J., F.L.S. Clapton.
Milnes, W., jun. Ashover, Derbyshire.
Mitchell, J. Inverness.
Mitchell, Sir T. L., LL.D., Lieut.-Col. Sydney.
Molesworth, Sir W., M.P., Bart., F.R.S. Pencarrow, Cornwall.
Monk, C. A.
Moody, W. 6, King's-bench-walk.
Moore, B. Lindley-hall.
Moore, J. C. 4, Hyde-park-gate.
Moore, Rev. R., M.A. Charboro', Dorset.
Moreton, J. Whitfield.
Morgan, C. O. S., F.R.S. Gloucest.-sq.
Morgan, T.
Morison, W., Maj.-Gen., M.A., C.B., M.P., F.R.S. 16, Saville-row.
Morley, E., Earl of. Kensington.
Morley, H. Frederick-villas, Brixton.
Mornay, A. F., F.L.S.
Morris, E. 25, Pulteney-street, Bath.
Morris, J. High-street, Kensington.
Morrison, J. 57, Upper Harley-street.
Mosley, Sir O., Bart.
Moysey, F. Pickhurst-mead, Kent.
Mudge, R. Z., Lieut.-Col., F.R.S. Beechwood.
Murchison, Sir R. I., F.R.S. 16, Belgrave-square.
Murray, J., F.S.A., L.S., & H.S.
Murray, J. 50, Albemarle-street.
Mushet, D. Coleford.
Mylne, R. W. Carlton-chambers.
Needham, J. M. Chiswell-street.
Neill, Sir P., F.R.S.E., S.A., & L.S. Edinburgh.
Nesbit, J. C. Kensington-lane.
Nesbitt, Maj. Wood-hill, Ireland.
Neville, R. J. Llangennech-park.
Nicholson, C., M.D. Sydney.
Nicholson, G. S. 6, Godliman-street.
Nicholson, G. T.
Nicol, J., F.R.S.E. 16, Grafton-street.
Norman, G. W. Bromley.
North, J., F.L.S. 9A, Gloucester-place.
Northampton, S. J. A., Marquis of, F.S.A. 145, Piccadilly.
Norton, J. H., M.D. Shirley, Southamp.
Norwich, E. S., D.D., Lord Bp.of, F.R.S.
Noyes, T. H.
Ogilby, W., B.A., F.S.A. Hanover-ter.
O'Gorman, G. 56, Baker-street.
Oldham, T., A.B. Dublin.
Onslow, Hon.Col. W. Clandon, Guildfd.
Ormerod, G., D.C.L., F.R.S. Sedbury-pk.

Ormerod, G. W., M.A. 85, Mosley-st., Manchester.
Otter, H.C., Capt. R.N. H.M.S. Sparrow.
Ouchterlony, J., Lieut. M.E. Madras.
Outram, B. F., M.D., F.R.S. 1, Hanover-square.
Owen, R., F.R.S.
Oxford, S. W., D.D., Lord Bishop of.
Page, T. Thames-tunnel.
Palmer, W. 6, King's-bench-walk.
Parish, Sir W., K.C.H., F.R.S.
Parke, Right Hon. Baron J. 56, Park-st.
Parker, J., jun. Upton Cheyney, Bristol.
Parr, T. C., M.A.
Parry, F. C., M.A.
Parry, T. G. Higham-ct., Gloucester.
Pasley, Sir C. W., Maj.-Gen. R.E., C.B., F.R.S. 12, Norfolk-crescent.
Pattinson, H.L. Bensham-grove, Gateah.
Pattison, S. R. Launceston.
Peel, Rt. Hon. Sir R., Bt., M.P., D.C.L., F.R.S. Whitehall-gardens.
Peile, J. H.
Peile, W. Whitehaven.
Pemberton, Rev. R. N. Church Stretton, Salop.
Pendarves, E. W. W., M.A., M.P., F.R.S. Pendarves, Truro.
Perkins, F., F.L.S. Park-street.
Perkins, H., F.L.S. & H.S. 3, Berkeley-street.
Perry, T. E., B.A. Bengal.
Perry, J. G. 12, Westbourne-street.
Petit, L. H., M.A., F.R.S., S.A., & L.S. 9, New-square, Lincoln's-inn.
Pett, S.
Philips, J., R.N.
Phillipps, J. H. Williamston, Pembroksh.
Phillipps, Sir T. Bart., M.A., F.R.S. Middle-hill, Worcestershire.
Phillips, J., F.R.S. York.
Phillips, R., F.R.S. Camberwell-green.
Phillips, Sir T. 11, King's-bench-walk.
Philpot, Rev. B. Cressingham, Brandon.
Picquot, A.
Playfair, L., M.D.
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Pollock, Sir F., M.A., F.R.S. Guildfd.-st.
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Nicholson, Robert, Royal Arcade, Newcastle-on-Tyne.
Oldham, James, Parliament-st., Hull.
Page, Thomas, 2, Middle Scotland-yard.
Palmer, Geo. H., 8, Westbourne-villas, Harrow-road.
Parkes, Josiah, 11, Great College-street.
Peel, George, Soho, Manchester.
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Mitchell, Alexander, Perth.
Mitchell, W., Central Station, Newcastle.
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Munday, James, Old Ford.
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Parsons, William, St. Martin's, Leicester.
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J. Farey. | W. Harding, C.E. | C. Varley. | J. Woods, C.E.
J. Glynn, C.E. | W. E. Newton.

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Aciand, Sir T. D., Bart., M.P., F.G.S. 85, Jermyn-street.
Antrobus, Sir E., Bart. 146, Piccadilly.
Abraham, R. 32, York-terrace.
Adams, W. B, Adam-st., Adelphi.
Adie, P. 395, Strand.
Alkin, A., F.L.S., F.G.S. 7, Bloomsbury-square.
Ainger, A. Carlton-hill, Edgware-road.
Ainsworth, R. Moss-bank, Bolton.
Albano, B. 24, Essex-street.
Allen, G. J. Dulwich-college.
Allison, J. 238, Regent-street.
Ames, J. 32, Green-street.
Ames, L. The Hyde.
Amesbury, J. 26, Fitzroy-square.
Amos, C. E. 15, Nelson-square.
Anderton, J. 20, Bridge-street.
Andrews, Maj. 25, Pelham-cres. Brmp.
Arnold, J. S. 21, Golden-square.
Ashurst, W. H. Muswell-hill.
Atkinson, T. 4, Duke-street.
Austin, B. 6, Montague-place.
Ayres, Dr. 6, Upper Portland-place, Wandsworth-road.
Buccleuch, the Duke of F.R.S. Montagu-house.
Bristol, the Marquis of, F.R.S., A.S. 6, St. James's-square.
Balcarres, the Earl of. Haigh-hall, Wigan.
Bolleau, Sir J. P., Bart. 20, Upper Brook-street.
Booth, Sir F., Bart. 43, Portland-pl.
Brown, Sir S., Capt. R.N. Vanburgh-lodge.
Brunel, Sir M. I., F.R.S. 1, Park-prospect.
Bailey, G. 13, Lincoln's-Inn-fields.
Bailey, J., M.P. 26, Belgrave-square.
Bain, W., M.D. Brunswick-street.
Baker, W. 35, Long-acre.
Banks, Rev. S. H. Dullingham, near Newmarket.
Barclay, A., M.R.I., F.G.S. Park-st.
Barclay, G. 38, Castle-street.
Barclay, R. 1, James-st., Adelphi.
Barlow, C. 99, Chancery-lane.
Barlow, P., F.R.S. Woolwich.
Barnard, E., M.P. Deptford.
Barnes, W. Church-court.
Barry, C., R.A. 32, Gt. George-street.
Barton, W. H. Royal Mint.
Basevi, G. Brighton.
Bates, J. 46, Portland-place.
Bateman, J., LL.D., F.R.A.S. East-India-road.
Battam, F. 2, Gough-sq., Fleet-street.
Beard, G. 25, Carey-street.
Beattie, J. Nine-elms.
Beaufoy, H., F.R.S., F.L.S. South Lambeth.
Bell, G. 186, Fleet-street.
Bell, J. 15, Langham-place.
Bell, J. Marlborough-terrace.
Bellamy, L. R. 4, South-square.
Bennet, J. 20, South Parade.
Berens, R. 19, Queen-street.
Berkeley, G. 24, Great George-street.
Bethell, R. Highgate.
Bettridge, J., jun. 6, Halkin-street, Belgrave-square.
Betts, E. L. 29, Tavistock-square.
Bevan, W. 5, Martin's-lane.
Biden, J. 37, Cheapside.
Birch, G. Horley, Surrey.
Bird, G. Hammersmith.
Bishop, C. 1, Lisson-grove.
Bishop, G. Regent's-park.
Blackwell, T. E. Devizes.
Blashfield, J. M. Commer.-rd., Lambeth.
Bodien, H. 13, John-st., Pentonville.
Bodkin, W. H. 8, Mansfield-street.
Bolding, H. J. 66, Hamilton-terrace.
Bonner, J. G. 7, Furnival's-inn.
Booker, T. W. Velindra-house.
Borthwick, M.A. 26, Charles-st., Haymk.
Bosanquet, A. 32, Fenchurch-street.
Botfield, B., M.P., F.R.S., F.S.A. Norton-hall.
Bowen, J. H. 4, Somerset-place.
Bower, G. 6, Tokenhouse-yard.
Braby, J. 22, Cranmer-place.
Brae, A. E. Park-square.
Braithwaite, J. 39, Bedford-square.
Branston, R. E. 36, St. Andrew's-hill.
Brett, A. 3, Furnival's-inn.
Brickwood, J. S. South-sea-house.
Bright, H. Grove-cottage, Ealing.
Broadwood, T. 33, Great Pulteney-st.
Brockedon, W., F.R.S. 29, Devonshire-st.
Brocklehurst, J., M.P. 33, Milk-street.
Brook, C. Healey-house, Huddersfield.
Brooks, W. 25, Mark-lane.
Brooman, R. A. 166, Fleet-street.
Brown, H., M.P. Tewkesbury.
Brown, R. Staffordshire.
Browne, Major H., E.I.C.S. 28, Soho-sq.
Browning, J. 113, St. John-street.
Brunel, I. K. 18, Duke-street.
Buller, J. Morval, Cornwall.
Burges, A. 23, Great George-street.
Burgess, W. R. 107, Strand.
Burch, W. Sewardstone, Essex.
Burton, D., F.G.S., M.R.I. 6, Spring-gardens.
Butler, J. L. Liverpool.
Butler, T. 4, Cheapside.
Butterworth, J. W. 7, Fleet-street.
Button, C. Holborn-bars.
Colborne, the Lord. 19, Hill-street.
Clarendon, Earl of. Grosvenor-crescent.
Clifford, H. Lord. Ugbrooke-park.
Curtis, Sir W., Bart. Netheravon-house, Amesbury, Wiltshire.
Curzon, the Hon. E. C. Scarsdale-ho., Kensington.

Codrington, Admiral Sir E., G.C.B., F.R.S. 92, Eaton-square.
Caarten, A. G. B. 19, Shaftesbury-cres.
Cabbell, B. B., M.P., F.R.S. Brick-court
Caldwell, Capt. W. 3, Audley-square.
Calthorp, R. G. 9, John-st., Adelphi.
Campbell, D. Emlyn Cottage, S. Wales.
Campbell, C. D. Hon. E.I.N.
Campbell, W. N. Kingsdown, Kent.
Campin, F. W. 210, Strand.
Carey, F. S. 21, Bloomsbury-street.
Carlisle, J. E. Hampstead.
Carpmael, W. 4, Old-square.
Chadwick, E. 4, Stanhope-street.
Chantrell, R. D. 21, Lincoln's-inn-fields.
Chaplin, W., jun. 12, Gloucester-road.
Chapman, H. 2, Upper Charles-street.
Chawner, T. 66, Guildford-street.
Child, S. Rownall-hall, Staffordshire.
Christy, J. F. Glass-works, Stangate.
Chubb, J. St. Paul's-churchyard.
Claridge, G. 2, Regent-place East, Reg.sq.
Claridge, J., M.D. Pershore, Worcester.
Clarke, F. Haslewood, Birmingham.
Clark, W. T., F.R.S. Hammersmith.
Clarke, R.. 27, Finchley-road.
Claudet, A. 20, Park-ter., Liverpool-rd.
Cluff, G. 24, Steward-street.
Colby, T., Col. R.E., LL.D., F.R.S. Athenæum-club.
Cole, H. Pub. Record Off., Carlton-ride.
Coles, J. Old Park, Clapham.
Collard, G. Walthamstow, Essex.
Colman, J. Stoke, Norwich.
Colnaghi, D. Pall-mall East.
Colquhoun, J. 12, St. James's-place.
Conduitt, E. 3, Upper Bedford-place.
Cooke, W. F. Eliot-hill, Blackheath.
Cooper, J. T. 82, Blackfriars-road.
Cooper, W. D. C. Dunstable.
Copeland, W. F. M. Layton, Essex.
Cornell, G. 66, Upper Norton-street.
Cottam, G., F.H.S. Winsley-street.
Courthope, C. F. 41, Park-road.
Courtney, W., jun. 54, Oxford-terrace.
Cousins, S., A.R.A. 12, Regent's-pk.-ter.
Coutts, Miss A. B. 1, Stratton-street.
Cowell, H. B. 4, Compton-street.
Cowley, J. C. 1, Park-crescent.
Crace, J. G. 14, Wigmore-street.
Crampton, T. R. 10, Buckingham-st.
Crane, H. S. Stratford, Essex.
Crawter, H. 7, Southampton-buildings.
Creswick, T., A.R.A. Linden-grove.
Croll, A. A. 48, Moorgate-street.
Cubitt, T. 3, Lyall-street.
Cubitt, W., M.P. Gray's-inn-road.
Cundall, J. 12, Old Bond-street.
Curling, J. Herne-hill, Surrey.
Cursetjee, A. Bombay.
Curteis, J. 39, Devonshire place.
Cutler, J. Spark Brook, Birmingham.
Dartmouth, W., Earl of, B.A., F.R.S. 1, St. James's-square.
De la Beche, Sir H. Craig's-court.
Danvers, J. Lancaster-place.
Davenport, H. D. 5, St. James's-street.
Davidson, T. 13, St. George's-place.
Davies, D. 15, Wigmore-street.
Davison, R., M. Inst. C.E. 41, Grace-church-street.
Day, J. W. Wellfield-house, Castle Eden, Durham.
Day, W. 17, Gate-st., Lincoln's-inn-fids.
Deacon, J. H. Holwell-house, Tavistock.
Dean, G. A. H. 40, Threadneedle-street.
Dean, T. 35, Threadneedle-street.
De Folly, M. Highgate.
De la Rue, W. 110, Bunhill-row.
Dell, T. Aylesbury.
Dent, E. J. 82, Strand.
Des Granges, P. 10, Elysium-row, Fulhm.
Dew, D. 4, Lambeth-place.
Dickson, P. 5, Chester-terrace.
Dilke, C. W., B.C.L. 76, Sloane-street.
Dockray, R. B. 13, Caneras-vale.
Dollond, G., F.R.S. 59, St. Paul's-chyd.
Domville, J. G.
Dower, J. 6, Cumming-place.
Dray, T. London-bridge.
Drayton, T. Regent's-street.
Drew, G. H. 28, Parliament-street.
Duesbury, H. Kensington Gore.
Duff, A. M. 8, Queen Anne-street.
Duncan, J. 72, Lombard-street.
Dutton, W. C. 5, Duncan-ter., Islington.
Dutton, J. Basinghall-street.
Duvall, J. C. A. 3, Northumberland-st.
Dyte, J. 106, Strand.
Ellesmere, F., Earl of. 18, Belgrave-sq.
Earle, J. Palace-gardens.
Eastlake, C. L., R.A. 7, Fitzroy-square.
Easton, J. 80, Blackfriars-road.
Easton, J., jun. 80, Blackfriars-road.
Easton, P. S. The Grove, Southwark.
Edwards, G. 37, Great George-street.
Edwards, G. Rye, Sussex.
Edwards, J. Newenden, Kent.
Elliot, J. 4, Martin's-lane, Cannon-st.
Ellis, J. Shalbrook-park, Surrey.
Emly, H. 3, New-square.
Errington, J. E. Adam-street, Adelphi.
Etchells, J. Ashton-under-Lyne.
Everett, W. Chase Side House, Enfield.
Fairbairn, P. Leeds.
Fairbairn, W. Manchester.
Faraday, M., D.C.L., F.R.S. Royal Inst.
Farey, J., M. Inst. C.E. 67, Guildford-st.
Feetham, W. 9, Clifford-street.
Fenn, J. 105, Newgate-street.
Field, J., F.R.S., V.P. Inst. C.E. Cheltenham-place.
Fillans, J. 82, Baker-street.
Fothergill, B. Globe Works, Manchester
Foster, P. Le N., M.A. 92, Chancery-la.
Fowler, F. E. H., M.I.B.A. 21, Saville-row, Burlington-gardens.
Fowler, J. 2, Queen-sq.-place, Westm.
Fox, C., M.Inst.C.E. 8, New-street.
Franks, G. Blackfriars-road.
Freeman, S. Coventry.
Frodsham, C. 84, Strand.

Fry, P. W. 14, Montague-street.
Fuller, F. 29, Abingdon-street.
Fuller, J. G. 28, St. James's-street.
Fuller, R. W. Croydon-lodge, Croydon.
Granville, the Earl. 16, Bruton-street.
Goldsmid, Baron De. St. John's Lodge.
Guest, Sir J. J., Bart., M.P. 8, Spring-gardens.
Gardiner, J. R. Duchy of Cornwall, Somerset-house.
Garling, H. 27, Bedford-row.
Garrett, G. K. 9, Albion-pl., Blackfriars.
Garrett, R. Leiston Works, near Saxmundham, Suffolk.
Geary, S. 10, Hamilton-place.
Gedge, J. 4, Wellington-street.
Gibbons, J. 345, Oxford-street.
Gibson, E., jun. Hull.
Gibson, T.
Gillett, W. S.
Gladstone, T. M. 3, Sidmouth-street.
Glasscock, —, Bishops Stortford.
Glover, T. 47, Myddleton-square.
Glynn, J., F.R.S., &c. 28, Westbourne-park-villas.
Goding, J. 2, Belgrave-square.
Goldsmid, A. A. 8, Cavendish-square.
Goldsworthy, J. H. High-street-place.
Gooch, J. Nine-elms.
Gooch, J. H. Grove-lane.
Good, W. 5, Charlotte-st., Blackfrs.-rd.
Goodwin, C. Lynn, Norfolk.
Gosnell, J. 3, King-ct., Lombard-st.
Graham, J. Mayfield, Manchester.
Grainger, T. M. Inst. C.E. Edinburgh.
Green, J. G. 19, St. James's-street.
Gregory, C. H. 1, Delahay-street.
Grenada, Agr. & Hor. Soc. of the Isl. of.
Grenfell, C. P. 38, Belgrave-square.
Grisbrook, W. Tenterden, Kent.
Grove, C. 150, New Bond-street.
Gurdon, W. Hill-house, East Bergott, Suffolk.
Gwilt, G., F.S A. 8, Union-street.
Howard, the Hon. C. W. G., M.P. 56, Park-street, Grosvenor-square.
Haddan, J. C. 29, Bloomsbury-square.
Hagen, E. Dock-head.
Hale, W. 73, Queen-street.
Hall, G. F. 15, Norfolk-street.
Hall, J. Great George-street.
Hall, S. Athenæum Club.
Hammersley, J. School of Design, Nottingham.
Hamilton, O. 15, James-street.
Hammond. W., jun. 9, Queen-square.
Hancock, J. L. Goswell-mews, Gosw.-rd.
Hanhart, M. 64, Charlotte-street.
Harding, J. D. 3, Abercorn-pl., Maida-hill
Harding, J. D., D.C.L. The College, Doctors'-commons.
Harding, W. Vine-st., York-rd., Lamb.
Hardwick, P. 60, Russell-square.
Hardy, R. W. H., Lieut. R.N. Sion Hill, Bath.
Harrison, G. 16, Carlton-house-terrace.
Harrison, H. 1, Percy-street.
Harrison, J. 3, Grosvenor-gate.
Harrison, T. R. St. Martin's-lane.
Hart, S., R.A. 16, Russell-place.
Hatchard, Rev. T. G. Rectory, Havant.
Hatcher, W. H., A. Inst.C.E. Electric Telegraph Comp. Offices, Bank.
Hawes, B., jun., M.P. 9, Queen-square.
Hawkins, B. W. 57, Cambridge-street, Hyde-park-square.
Hay, D. R. 90, George-street, Edinb.
Hayward, J. P. 88, Newgate-street.
Heberden, T., M.D. 11, Up. Brook-st.
Helbert, J. H. 60, Gloucester-place.
Hendrie, R. 12, Tichbourne-street.
Herbert, J. R., R.A. 1, Gloster-place.
Heseltine, S. Bromley, Middlesex.
Hetley, J. H. 35, Soho-square.
Hewitt, D. P. 23, Great George-street.
Hewitt, F. K. Old Hummums.
Hick, J. Bolton.
Hickson, S. Highgate.
Higgins, J., M.R.I. 370, Oxford-street.
Highton, E. Clarence-villa, Reg.-park.
Hislop, C. 20, Gutter-lane.
Hoare, C., F.R.S., &c. 37, Fleet-street.
Hoare, D. J. 8, Cecil-street, Strand.
Hoblyn, T., F.R.S. White Barns, Herts.
Hodgson, C. J. 406, Strand.
Holford, J. Holford-house, Regent's-pk.
Holland, J. Ranelagh Works, Belg.-sq.
Holland, W. 19, Marylebone-street.
Hollier, E., F.S.A., &c. 12, Great Winchester-street.
Hollins, M. D. Stoke-upon-Trent.
Holmes, J. 4, New Ormond-street.
Holmes, N. J. Wetherall-pl., Hampstd.
Horton, J. 38, Devonshire-street.
Horsfall, H. Vauxhall foundry, Liverp'l.
Hoskyns, C. W. Wraxall Abbey, Warwick
How, G. 119, Gt. Guildford-st., Boro'.
Howard, D. 6, Torrington-pl., Torrington-square.
Hoy, H. B. 14, Pancras-vale.
Hubert, S. M. Wandsworth.
Hughes, W. H., F.S.A., &c. 12, King's Bench-walk.
Humby, G. Carlton-chambers.
Hume, J., M.P. 6, Bryanston-square.
Hutchinson, W. East Temple-chambers.
Hutton, J. Marsk, Yorkshire.
Hyde, J. P. 22, Cecil-street.
Ilchester, Earl of. 31, Burlington-street.
Jackson, A. R., M.D. Warley, near Brentwood, Essex.
Jackson, W. Grove-road, Brixton.
Jackson, Rev. W. Pitsford, Northamp.
Jee, A. S. 6, John-street, Adelphi.
Jenkins, C. 4, Horner-street, Lambeth.
Jennings, G. 29, Gt. Charlotte-st., Blkfrs.
Jennings, T. H. Birmingham.
Jobson, J. Dudley.
Johnson, A. 7, Gresham-street West.
Johnson, W. Millbank-row.
Johnstone, J. Willow-park, Greenock.
Jones, J. 338, Strand.

Jones, O. 9, Argyle-place.
Jordan, T. B. Belvidere-road, Lambeth.
Judkins, E. Beaufort-buildings.
Jutsum, H. Maida-hill.
Keith, G. 11, Princes-street.
Kelsey, R. 73, Chiswell-street.
Kemble, H. 10, Mincing-lane.
Kemp, G. T. 35, Spital-square.
Kendall, H. E. 17, Suffolk-street.
Knight, C. 90, Fleet-street.
Kymer, J.
Lansdowne, the Marquis of, F.R.S., &c. 54, Berkeley-square.
Lonsdale, the Earl of, F.R.S., &c. 15, Carlton-terrace.
Lindsey, Sir C. 10, Duke-st., St. James.
Laing, D. G. 2, Villiers-street, Strand.
Langdon, A. 28, Great Russell-street.
Lapworth, A. 19, Old Bond-street.
Laurie, J. 1, Hyde-park-place.
Law, T. 30, St. Swithin's-lane.
Lawes, Capt. R.N. Sussex-square.
Lawson, H. Lansdowne-crescent, Bath.
Leach, G. 16, Mariborough-place.
Leaf, W. 39, Old Change.
Leake, F. 9, Warwick-street, Reg.-st.
Le Couteur, Col. Island of Jersey.
Lee, C. 20, Golden-square.
Lee, J. F., LL.D. Doctors' Commons.
Lee, S. H. Dalston.
Lefevre, J. S. House of Lords.
Le Mann, F. J. 15, Threadneedle-street.
Levey, G. Great New-street.
Levien, S. New South Wales.
Lewis, S., jun. 195, Regent-street.
Lewis, T. Walker's Hotel.
Lindley, W., M. Inst. C.E. 8, Royal-ter.
Lister, W. 15, Manchester-buildings.
Little, G. 3, Furnival's-inn.
Lloyd, L. A. Gray's-inn.
Lloyd, S. J. 22, Norfolk-st., Park-lane.
Lobb, W., M.D. 12, Aldersgate-street.
Lock, J., M.P. 6, Chester-ter., Reg.-pk.
Lockett, J. Fennell-st., Manchester.
Long, W. Preshaw-house, Hants.
Lott, T. 43, Bow-lane.
Low, R. 330, Strand.
Lowe, G., F.R.S. 39, Finsbury-circus.
Lowry, J. W. 45, Robert-street.
Lund, H. Hare-court.
Manvers, the Earl. 13, Portman-sq.
M'Adam, Sir J. 22, Whitehall-place.
Macbryde, C. W. 45, Watling-street.
Macgrigor, W. F. Vauxhall Foundry, Liverpool.
Mackerness, T. 37, West-sq., Southw.
Maclise, D., R.A. 14, Russell-place.
Macniell, W. 60, St. Martin's-lane.
Macpherson, R. 76, Lombard-street.
Magrath, E. Athenæum, Pall-mall.
Mair, G. 18, Charlotte-street.
Marriott, J. Dewsbury, Yorkshire.
Martin, S. D. 10, Regent-villas.
Martineau, W. H. 9, Howard-street.
Mastalier, Dr.
Masters, G. 294, Regent-street.
Matthews, W. 367, Strand.
Maudslay, T. Cheltenham-place.
Maw, T. 11, Aldersgate-street.
Mawley, H. 43, Gower-street.
M'Ewen, R. High Mark, Stranraer.
M'Clean, J. R. 17, Great George-street.
Medley, F. Notting-hill-square.
Meeking, C. Streatham.
Meinertzhagen, D. 10, Moorgate-st.
Merle, W. H. 24, Lansdowne-place, Cheltenham.
Merrifield, C. W. Privy Council Office.
Messenger, S. Birmingham.
Meyer, C. P. Enfield.
Miles, C. 90, Great Russell-street.
Miller, T. C. 1, Alfred-pl., Bedford-sq.
Minton, H. Stoke-upon-Trent.
Moffatt, G., M.P. 85, Eaton-square.
Moore, G., F.R.S., &c. 64, Lincoln's-Inn-fields.
Moore, J. 45, Goswell-road.
Morgan, J. 27, Hoxton-square.
Morgan, O., M.P., F.R.S. 9, Pall-mall.
Morrell, G. F. 149, Fleet-street.
Morrison, J., M.P. 57, Up. Harley-st.
Morson, T. N. R. Southampton-row.
Mortimer, J. Hanover-square.
Mortlock, J. 250, Oxford-street.
Mortlock, W. 18, Regent-street.
Morton, J. C. Whitfield Berkeley, Glouc.
Mott, I. H. R., D.M. 76, Strand.
Moulton, S. 32, Chester-street.
Mudge, Col. R. E. Southampton.
Munday, J. 20½, Abchurch-lane.
Murchison, J. H. 10, Holles-street.
Murdoch, R. 1, Upper Vernon-street.
Musgrave, T. 6, Gordon-square.
Northumberland, the Duke of, F.R.S., &c. Northumberland-house.
Norfolk, the Duke of, K.G. Norfolk-ho.
Northampton, the Marquis of, P.R.S. Piccadilly.
Northeak, the Earl of. Winchester, Hants
Nathan, J. 11, Hensley-st., Tavistk.-sq.
Neeld, J., M.P. 6, Grosvenor-square.
Newall, R. S. Gateshead.
Newington, Dr. Krole Frant, Tunb. Wells
Newton, W. 66, Chancery-lane.
Newton, W. E. 66, Chancery-lane.
Normanville, W. J. Glynn-cottage.
Northcoate, S. H. Board of Trade.
Norton, G. J. Kennington.
Nurse, W. M. Hyde-park.
Orkney, the Earl of, Taplow-court, near Maidenhead.
Olive, J. 4, York-terrace.
Osborne, S., jun., F.L.S. 4, Stockwell-park, Brixton.
Oxenford, J. 16, John-st., Bedford-row.
Portland, the Duke of, F.R.S. Harcourt-house.
Phipps, Col. the Hon., C.B. Windsor-cast.
Page, T. 3, Eccleston-square.
Palmer, P. 118, St. Martin's-lane.
Palmer, W. H. 24, Bedford-row.
Parry, T. 88, Bloomfield-rd., Paddingt.

Paxton, A. F. West Cholderton-house, Wilts.
Payne, J. 1, Churchyard-court.
Paynter, J. 64, Coleman-street.
Pellatt, A. Holland-street.
Penmethorne, J. 7, Whitehall-yard.
Pepys, J. 8, Lower Berkeley-street.
Pepys, W. H., F.R.S., &c. 11, Earl's-terrace.
Percival, R., F.S.A. 76, Lombard-st.
Perry, G. 30, Spencer-street, Northampton-square.
Perry, R. W. 6, Sussex-terrace.
Petit, L. H., F.R.S., &c. 9, New-sq.
Phil, O. 29, Granville-sq., Pentonville.
Phillips, H. W. 8, George-street.
Phillips, H. 24, Long-acre.
Phillips, W. P. 359, Oxford-street.
Pickton, H. Normal School, Southwk.
Pilgrim, C. H. Bear-place, Maidenhead.
Platow, W. 55, High Holborn.
Platt, J. 22, Park-square East.
Plomley, F., M.D. Maidstone.
Plomley, J. F. Rye, Sussex.
Pole, W., F.R.S. 18, Old-square.
Powles, J. D. 6, York-place.
Prichard, W. B. Orsedd-villa, St. John's-wood.
Prideaux, F. S. Southampton.
Princep, W.H. Gt.West.Rail., Paddgn.
Prior, E. 48, York-terrace, Regent's-pk.
Proctor, J. 18, Cheapside.
Prosser, R. 1, Cherry-st., Birmingham.
Provis, W. A. The Grange, Salop.
Pryor, W. S. Broad-street-buildings.
Russia, His Imperial Majesty the Emperor of.
Radnor, the Earl of, F.R.S., &c. 52, Lower Grosvenor-street.
Romney, the Earl, F.R.S., &c. Maidstone.
Radcliffe, Sir J., Bart. Rudding-park, Yorkshire.
Richardson, Sir W. H. Southampton.
Ross, Sir W. C., R.A. 38, Fitzroy-sq.
Ramsden, R. 7, Brook-street, Holborn.
Randell, G. 41, Burton-crescent.
Rastrick, J. U., M. Inst. C.E.
Rea, E. 115, Wardour-street.
Redgrave, R., A.R.A. Hyde-park-gate, Kensington Gore.
Redgrave, S. Hyde-park-gate.
Reeves, J., F.R.S. and F.L.S. Clapham.
Reeves, J. R., F.R.S. and F.L.S. Coleman-street.
Reid, W. 25, University-street.
Reinagle, R. 5, Whitehead's-grove.
Rendel, J. M. 8, Great George-street.
Reveley, G. J. 17, Queen-sq., Bloomsbury.
Reveley, H. W. Sunny-hill, Dorset.
Reveley, W. A. 17, Queen-sq., Bloomsbury.
Ricardo, J. L., M.P. 31, Lowndes-sq.
Ricardo, M. Brighton.
Richardson, B. Wordsley Works, Stourbridge.
Richardson, J. Wordsley Works, Stourbridge.
Roberts, H. 28, Brunswick-square.
Roberts, D., R.A. 7, Fitzroy-street.
Robins, G. Lyndhurst-square.
Robinson, J. 7, Gower-st., Bedfd.-sq.
Rofe, J. Winkley-square, Preston.
Rogers, E. 12, St. Helen's-place.
Roget, P. M., M.D., Sec. R.S., &c. 18, Upper Bedford-place.
Romilly, E. 14, Stratton-street.
Ross, A. 2, Featherstone-buildings.
Rose, W. Coalport, Shropshire.
Rotch, B. (V.P.) 1, Furnival's-inn.
Rowe, J. B. Brentford.
Rush, G. Elsingham-hall, Bishops Stortford.
Russell, J. J. Wednesbury.
Russell, T. H. Wednesbury.
Sutherland, the Duke of, K.G. Stafford-house.
Stanhope, the Earl. 20, Charles-street.
Smart, Sir G. 91, Great Portland-street.
Samuelson, M. Post-office, Banbury.
Saunders, J. E. 16, Finsbury-square.
Saunders, T. Hammersmith.
Saunders, W. W. East-hill, Wandswth.
Saward, M. 9, Chatham-pl., Blackfrs.
Schneider, R.
Scholey, W. Stockwell-common.
Scott, G. G. 29, Spring-gardens.
Scott, H. E. 14, Gray's-inn-square.
Scott, J. A. 13, Pall-mall East.
Scott, H. D. 10, Ecclestone-street.
Scriviner, R. Alperton Tile-works, Acton.
Sex, E. Stock Exchange.
Seymour, W. Brighton.
Sharpe, E. 2, Devonshire-terrace.
Shears, D. T. Bankside.
Sheppard, R. Newport Pagnell.
Sherriff, G. W. Streatham-hill.
Shore, O. Upper Clapton.
Shuter, T. A. Hooley-house, Surrey.
Sich, H. Chiswick.
Silverlock, H.S, Wardrobe-ter., Doc.Com.
Simmonds, A. 6, Adelphi-terrace.
Simpson, J. 33, Great George-street
Simpson, W. B. 456, Strand.
Skeat, W. 6, Park-place-villas.
Skelton, G.
Smart, J. Camberwell.
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Smirke, S. 24, Berkeley-square.
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Smith, J.
Smith, J. S. Whitechapel Distillery.
Smith, J. J. Roscoe-place, Sheffield.
Smith, R. P. Avenue de St. Cloud, 29, Paris.
Smith, W. 69, Princes-street.
Solly, E. 33, Bedford-place.
Solly, H. Tipton, Birmingham.

Solly, I.
Solly, J. Tipton, Birmingham.
Solly, R. H., F.R.S., &c. 48, Great Ormond-street.
Solly, S. R., M.A., F.R.S., &c. 10, Manchester-square.
Solly, W. H. Surge-hill, Herts.
Sopwith, T. Chapel-place, Duke-street.
Spear, J. 39, Gloucester-road.
Speer, E. Treasury.
Spence, W. 50, Chancery-lane.
Spiers, R. J. Oxford.
Standidge, W. 36, Old Jewry.
Stapylton, M. Myton-hall, Boro'bridge.
Staunton, M. 9, Strand.
Staunton, W. S. 9, Strand.
Stephenson, R., M.P. 24, Gt. George-st.
Storey, W. J. C. 12, Mariborough-place, St. John's-wood.
Strutt, E. 42, South-street.
Sutton, R. Royal Exchange.
Taber, J. Herne-hill.
Talbot, T. M. Penric-castle, Glamorganshire.
Tanqueray, C. T. Distillery, Vine-st.
Taylor, J., F.R.S. 2, Duke-street.
Taylor, J., jun. 2, Duke-street.
Taylor, J. 11, St. George's-pl., Knightsbridge.
Taylor, J., jun. 22, Parliament-street.
Tebbitt, W. Cottage-ho., Clapham-com.
Tennant, J. 149, Strand.
Tenniel, J. B. 22, Gloucester-place.
Terni, V. Cushion-court.
Thackeray, W. M. 13, Young-st., Kens.
Thompson, J. Camden-hill-terrace.
Thompson, N.
Thompson, R. G. Kirby-hall, Boroughbridge.
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Thurston, J. Catherine-street.
Thurston, S. 9, Southampton-street.
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Tooke, W., F.R.S. 12, Russell-square.
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Topham, T. Ripley, Derby.
Tulloch, J., F.R.S., &c. 16, Montague-pl.
Twining, R., F.R.S. 13, Bedford-place.
Twining, T., jun. Perryn-house, Twickenham.
Twining, H. Grove-ho., Clapham-com.
Uwins, T., R.A. Victoria-road.
Varley, C. 1, Charles-street.
Varnish, E. Hyde-park-gate-villa, South
Varty, T. 31, Strand.
Vaughan, G. 28, Cumberland-terrace.
Vaughan, P. 70, Fenchurch-street.
Veitch, J. 6, Ovington-sq., Brompton.
Vulliamy, B. L., F.R.A.S., &c. 68, Pall-mall.
Willoughby, De B., Lord. 21, Hill-street.
Wilde, Sir T. 65, Eaton-square.
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Weatherby, J. 6, Old Burlington-street.
Webb, C. L. Poets' Corner.
Webb, E. B. Castle Lecky, Newtown, Limarady, Derry.
Webb, J. 5, Old Bond-street.
Webster, T., M.A. (V.P.) 2, Pump-ct.
Webster, T., R.A. The Mall.
Webster, W. B. Hounsdown, Southampton.
Weedon, T. 41, Hart-street.
Wells, J. S.
Wenham, T. Brompton.
Westley, W. 24, Regent-street.
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Wyse, T., M.P. 17, Wilton-place.
Yarrell, W. 6, Little Ryder-street.
Yates, J. A. 33, Bryanston-square.
Yewd, W. 30, East-street.
Yool, H. Mill-street.
Zornlin, J. J., jun. 10, Bethel-place.

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BRITISH ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.

The NINETEENTH MEETING of the Assoc. will be held at BIRMINGHAM, Sept. 1849.

THE REV. DR. ROBINSON, OF ARMAGH.—*President.*

Vice-Presidents.

Earl of Harrowby.	Sir Robert Peel, Bart.	Professor Willis.
Lord Rothsay.	Professor Faraday.	Sir David Brewster.

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Assistant General Secretary..... Professor Phillips, F.R.S., York.
General Treasurer ..... John Taylor, F.R.S., Duke-street, Adelphi.
Local Secretaries ..... William Wills, Esq., Birmingham.
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THE GENERAL COMMITTEE will meet immediately on the holding of the meeting for the Election of Sectional Officers, and the despatch of business usually brought before that body. On this occasion there will be presented the Report of the Council, embodying their proceedings during the past year. The General Committee will meet afterwards by adjournment.

AT THE FIRST GENERAL MEETING the President will deliver an Address.

AT THE EVENING MEETINGS, which will take place at 8 P.M., Discourses on certain branches of Science will be delivered, and opportunity afforded for general conversation among the Members.

EXCURSIONS will be made to interesting points in the district, more especially to those connected with the several branches of Manufactures, and Geological and Mineral pursuits; and the COMMITTEES of the VARIOUS SECTIONS will meet daily.

REPORTS on the Progress of Science, and of Researches intrusted to individuals and Committees, and other communications intended for presentation to the Sections, are expected to be forwarded in letters addressed to the *Assistant General Secretary*, previously to the Meeting, accompanied by a statement whether the author will be present, and on what day, so that the business of the Sections may be satisfactorily arranged.

The REPORTS complete, and careful ABSTRACTS of other communications, are to be delivered to the Secretaries of the Sections before which they are read, previously to the close of the Meeting, for publication in the Transactions. As the Reports on Science may be interesting to more Sections than the one which originally called for them, it is desirable that the authors should be prepared to furnish the means of reading them in any other Section at the request of the President and Secretaries of that Section.

The following form the principal subjects to which attention will be directed, with such other papers as may be submitted:—

Mathematics and Physics; Chemistry and Mineralogy, including their applications to Agriculture and the Arts; Geology and Physical Geography; Zoology and Botany, including Physiology; Ethnology; Statistics; Mechanical Science.

MUSEUM OF PRACTICAL GEOLOGY.

It has been with much satisfaction that we have witnessed the awakening of our Government to the importance of aiding in the great work of giving to the public increased means of acquiring knowledge on all those matters which immediately connect themselves with the useful purposes of life. By so doing, a more perfect condition is gradually, though perhaps slowly, established throughout the entire community, and the power for improvement materially increased. In this busy age, when the attention of all thinking men is directed to the applications of science to the economy of manufacture, it becomes of the highest importance that the facilities of reference, to the native productions of our country, and the applications which have already been made, should be greatly increased. Imperfect knowledge of the character of the natural material, and slight acquaintance with the appliances which have been made, lead too frequently to considerable expenditure of ingenuity, time, and money, upon an object which turns out to be useless. The loss to the individual is often ruinous, and the whole nation suffers in this unfortunate waste of the elements of its power. With the march of improvement our statesmen have discovered that it is more satisfactory to rule an educated than an ignorant people, and they are beginning to see that the improvement of the intellectual standard of the mass must be followed by advancing commercial prosperity, and a corresponding increase of our national power. These remarks apply with the greatest force at the present time to our mining operations. Never was there a period when it became so imperative a necessity to enlist all the knowledge, scientific and practical, that we possess, in and of our mineral productions in all the operations of mining and metallurgy. It cannot be denied, notwithstanding the vast importance of our mineral wealth, that most of our operations are less perfect than those of many of the continental states, which are producing infinitely less from the soil than Great Britain does. With advantages superior to Germany or Belgium, we are not working so economically or so efficiently.

Germany possesses admirable mining colleges, in which every department of scientific knowledge, that can be profitably employed in working metals, is taught by the most efficient instructors. The school of mines at Paris is another example of the enlarged views taken by the French nation, and of the importance of a comprehensive system of instruction for those to whom all national works, whether mining, metallurgical, or of

an engineering character, are to be intrusted. In England, with a mineral wealth equal to £20,000,000 annual produce, and capable of being greatly increased, we have not a recognised system of instruction. The consequences have been, and still continue to some extent to be, that charlatanry and pretension have taken the place of true practical knowledge, and a great waste, attended with grievous disappointment, has rapidly followed, in too many examples, which promised at the commencement to lead to a favourable issue. As mining, metallurgy, and metallic manufacture require the scientific aid of geology and mineralogy, chemistry and mechanics, and some general acquaintance with the laws of the physical forces, it has long been felt that it was important to have some exposition of these elements from which the public, or those of them who are interested in the progress of this great branch of national industry, should be enabled to procure information.

With this object in view, the Museum of Practical Geology has been established by the Government, under the able direction of Sir Henry De la Beche, with whom the suggestions which eventually led to the formation of the museum originated. It is at present located in Craig's-court, but a handsome and commodious building is erected in Jermyn-street and Piccadilly, in which, within a short period, the public will have an opportunity of examining more completely than is practical at present the valuable collection of illustrative specimens which are here brought together. Notwithstanding the want of room and light in the present confined premises, 5 and 6 in Craig's-court, the limits of which entirely prevent that systematic arrangement which is to be desired, and which is intended, the visitor will be well repaid by a visit. Thinking we shall render a service to our readers and, indeed, to the public at large, by briefly describing the more prominent features which present themselves, and also to the Institution, by calling public attention to its importance, we have resolved on devoting a few pages to this object.

As we have stated, Sir Henry De la Beche is the director of the museum. He is also the director-general of the geological survey of the United Kingdom, and under him, in connection with either the geological survey or the Museum of Practical Geology, he has the following officers:—

Local Director for England ..	Professor A. C. RAMSAY.
„ *for Ireland* ..	Professor OLDHAM.
Palæontologist	Professor E. FORBES.
Mining Geologist	W. SMYTH.
Curator and Chemists	R. PHILLIPS and Dr. L. PLAYFAIR.
Keeper of Mining Records....	R. HUNT.
Librarian, &c.	T. REEKS.

The present establishment consists of five apartments devoted to the specimens for exhibition, the mining record and geological survey offices, and an extensive and well-arranged laboratory, devoted to analytical investigation.

The first apartment, on the ground floor, contains an interesting collection of building-stones from various localities, a great number of those having been submitted to the commission appointed in 1838 to determine on the stone which should be employed for the new Houses of Parliament. These specimens consist of six-inch cubes, and amongst them will be found, all duly labelled, the magnesian limestones of Bolsover, of Mansfield, and many other places, and of the oolitic limestones of Grove Quarry and Bath, &c. These cases form a complete illustration of the report of the commissioners, and with that report in our hands, "We may," as Mr. Sopwith says in his account of the museum, "obtain a greater amount of knowledge respecting the principal building-stones in the kingdom than could previously have been gained by a tour of some months to nearly two hundred quarries, followed by a vast number of chemical and mechanical experiments. This collection, therefore, points out, in a manner which every one must clearly comprehend, the great practical value as well as interesting nature of the science of economic geology."

In the same apartment will be found specimens of the Devonshire, Cornish, and Aberdeen granites, with elvans or porphyries, and the limestones of Devonshire and Derbyshire, with the serpentine rocks of the Lizard, which are now employed for many ornamental purposes, being extremely beautiful, particularly where veins of red traverse the olive-green ground mixed with lighter tints. On the walls will be found many very interesting slabs of polished granite from Scotland, and serpentines from the south of Ireland, together with inlaid slabs of the Derbyshire and Staffordshire marbles, and several other varieties of ornamental stones.

Wherever it is practical, we find the native material and its applications side by side; thus we have specimens of gypsum, plaster of Paris in its amorphous and crystalline state; in the same case we have the prepared dry plaster, and examples of its employment for moulding, and in combination with chemical agents producing Keene's cement, terra cotta, &c. These several points are well shown in a beautiful copy of Baily's Eve, and several other copies from well-known pieces of sculpture.

In another case will be found specimens of the Cornish and Devonshire china-stone, and the washed china-clay so extensively used in our potteries; and beside these, we have numerous good examples of our modern porcelain manufacture, furnished from the establishment of Messrs. Copeland and Co., together with encaustic tiles in their various states, as formed by Messrs.

Minton and Co., by their patent process of compressing the dry china-clay in moulds; and also a series of medallions by Wedgwood in imitation of the ware employed in the Portland vase, which are well deserving of examination.

In this apartment we have also the beginning of an historical series of great value, as illustrating the progress of fictile manufactures. Here we have Egyptian pottery and many very choice examples of the Etruscan manufacture,—of which, also, some fine vases will be found in the upper gallery,—specimens of Mexican pottery, and numerous excellent illustrations of various European porcelain manufactures, including the celebrated Raffaelesque ware. In an upper apartment will be found a good collection of Staffordshire earthenware from the first rude and imperfect brown ware butter-pots and many-handled *tygs*, down to the period when Wedgwood so essentially improved our pottery by the introduction of his famous improvements.

In the rooms on the first floor will be found a most valuable collection of mineralogical specimens, those in the centre cases forming a good series illustrative of our own mineral productions, whilst those in the upright cases are specimens of foreign ores, for comparison. As the object is to form a collection of such minerals as are practically valuable, the specimens are of that character which represents in the best manner the varieties of ore which are commercially important.

The copper ores, the ores of tin, and those of lead, are very complete; some very good specimens of native silver and gold from the Merionethshire mine will also be found here. A very complete series of the hematite iron ore, of the argillaceous or clay iron-stones, and of the black band, occupy some large cases. Manganese and zinc ores, with specimens of the rarer and less valuable minerals, may also be examined.

Several cases contain fine specimens, showing the character of the bituminous and anthracite coal; and one, exceedingly well arranged, displays the order of occurrence of the carboniferous deposits, and sandstones, and shales.

A very excellent series of *lode* specimens will be found in the outer room. By reference to these, we learn all the conditions in which the minerals copper, tin, and lead present themselves in nature. These are most admirably adapted to all the purposes of a mining education. A series of pseudomorphous crystals are exceedingly interesting as examples of those very curious changes which occur in nature.

As the applications are the especial object of this museum, we find in this apartment good examples of the iron and steel manufactures, and also of copper smelting, and a series of specimens illustrating the formation of the compound metal generally known as German silver. Around the room will be seen some beautiful castings, and some statuettes in iron, copper, tin, brass,

and bronze, to exhibit the characteristics of the pure and mixed metals. Some good examples illustrative of the progress of metallurgical knowledge are also here, but we understand that as soon as space can be found for the specimens, this series will be rendered much more complete than it is. In connection with these, the process of the electrotype is well illustrated by copies of the "Triumph of Alexander," and numerous smaller examples, and in particular a most beautiful set of plants and flowers, the fine forms of which are preserved by the precipitation of copper upon their surface. The perfection of this process is remarkable, every portion, even the most delicate, being faithfully preserved in metal.

The specimens of glass, which are unfortunately now somewhat out of arrangement, and must remain so until the removal to the new gallery takes place, well deserve attention. The historical series commences with Egyptian specimens and some choice examples of ancient manufacture from Pompeii. Early Venetian and German glass, of which several varieties will be found, form a curious continuation of the series, which of course ends with the most choice productions of our own time, both German, French, and English.

The process of enamelling, which consists indeed in fusing upon metal plates metallic oxides combined with silica, forms a highly instructive and most interesting example of the principle which guides the selection of illustrations of practical applications.

Numerous other specimens of native production and ingenuity might be named, but we pass these over to draw attention to the models of mining machinery and geological phenomena, which form, for us, really the most interesting part of the collection.

A series of beautiful dissected models of Dean Forest, of Ebbw Vale, and Nentsbury, constructed by Mr. Sopwith, in which all the geological and mineralogical features of these districts may be studied and the mining operations examined, are most valuable for practical and educational purposes. A good model of the landslip at Axminster shows the change produced by this peculiar phenomenon over a rather extensive district.

Among the models of mining machinery the most striking are those of Taylor's pumping-engine at the United Mines in Cornwall, the steam-whim at East Wheal Crofty, the steam-stamps at Carn Brea Mines, and a beautiful model of Darlington's hydraulic engine at the Alports Mines (through want of room this model is at present in the Mining Record Office, but it can always be examined on application).

The various machines employed in the processes of washing are also shown in model, but a most excellent sectional model of Dolcoath Mine merits close attention, representing as it does the shafts and levels, with the surface workings, on a sufficiently

large scale to render the whole intelligible. A model of an iron furnace with the hot and cold blast, with the blowing apparatus and condensing sphere, will also be found in this department, and,—interesting as a matter of history,—the first hydraulic press made by Bramah. This department also contains specimens of the mining tools of the Mexicans, of the Germans, of the Russians, and those used by our own miners in Cornwall and in our collieries.

Although it is impracticable in the present place to render any section of this establishment complete, we think we have shown sufficiently the object in view to prove the real value of such an institution to the public when it shall be perfectly organized. We know that the director is most actively engaged in completing as expeditiously as is practical every series at present included, but of course with enlarged means and capacious premises these will naturally extend themselves.

In the Mining Record Office are deposited the plans and sections of mines, and strenuous efforts are being made by the present "keeper" to collect as large an amount of statistical information as is possible, so as to afford to the Government and the public every information possible in connection with the mineral wealth of our kingdom.

We must not omit to state that the Museum of Practical Geology is open to the public gratuitously every day throughout the year, excepting, of course, Sundays, Christmas-day, and Good Friday.

We sincerely hope, under the more enlightened policy which is now directing the internal government of this great country, that we shall find the utmost encouragement given to an institution which should be an honour to the land, and afford to every one, from the peer to the peasant, all the information and instruction which may be required in connection with the increasing mining interests of the kingdom.

GEOLOGICAL AND POLYTECHNIC SOCIETY OF THE WEST RIDING OF YORKSHIRE.

This Society was established in the year 1838, and originated at one of the meetings of the Coalowners' Association. Previous to that period very little information was possessed, even by the coalowners themselves, of the relative position and connection of the seams of coal, distinguished in different localities by various local names, nor had they any knowledge of the

general extent of the Yorkshire coal formation. The value of the Society, then, must be estimated not merely by the matter contained in its published transactions, but by the spirit of inquiry which it has undoubtedly tended to establish in the minds of the mineral proprietors. The relative position of the several seams has been correctly established; and they can now be traced, with only one break, from the Valley of the Aire to that of the Don, and southward into Derbyshire. The importance of this, in a mining point of view, will be readily understood. Originating in the manner just described, its principal attention has been naturally directed to the examination of the Yorkshire coal-fields; but it was neither the wish of its promoters, nor has it been for want of exertions on their part, that it has not extended its operations, as it might with great advantage have done, to the consideration of questions connected with the staple trades of the district, or the machinery or processes employed therein. The objects of the Society are more particularly detailed in a masterly address read by Professor Johnston at one of their earliest meetings, and published at the request of the Society.*

The Society, at its establishment, was warmly supported by Earl Fitzwilliam, who offered the munificent donation of 500*l.* towards the erection of a museum, and who has continued to manifest the deepest interest in its proceedings. It holds its meetings quarterly in the principal towns of the riding, and by this means tends to keep alive in all parts of the district a spirit of inquiry. At these meetings papers are read by members and strangers, and discussions take place. The Society also possesses a most valuable collection of the fossils of the Yorkshire coal-field, which it purposes to arrange so as to ascertain whether any and what organic forms are peculiar to any particular seam of coal and ironstone. This collection is at present deposited in one of the rooms of the Philosophical and Literary Society of Leeds, the attempt to procure a separate museum not having succeeded, notwithstanding the splendid offer of Earl Fitzwilliam.

The Society also publishes, from time to time, the papers which have been read at its various meetings. Among these are—a paper by Professor Phillips, on the microscopic fossils of the rocks of Yorkshire; a series of most valuable contributions to Yorkshire geology, by the present indefatigable Secretary, the Rev. W. Thorp, Vicar of Misson, who has also contributed some interesting papers on the agriculture of the district, taken in connection with its geological character, and applying to the subject the discoveries of modern chemistry. Other papers by

* The Economy of a Coal-Field, an Exposition of the Objects of the Geological and Polytechnic Society of the West Riding of Yorkshire, and of the best means of obtaining them. By James F. W. Johnston, F.R.S.S.L. and E., F.G.S., Reader of Chemistry and Mineralogy in the University of Durham.

gentlemen connected with the working of the mines, have appeared from the pens of Messrs. Embleton, Briggs, and Morton; and communications on other subjects of local interest have been furnished by Messrs. West, Binney, Clay, and others.

The Society is governed by a President, Council, and Honorary Secretary; and it has in Mr. Henry Denny, curator of the Philosophical and Literary Society of Leeds, the advantage of having an accomplished naturalist as its Assistant-Secretary.

The present number of members is about 170. The subscription, unlike most societies of the kind, was purposely fixed low, that it might not exclude by pecuniary considerations any who would otherwise join its ranks. It was at first only 10*s.* 6*d.*, to which has since been added the price of the Reports, 2*s.* 6*d.*, making the total subscription only 13*s.*

INSTITUTION OF CIVIL ENGINEERS.

BYE-LAWS AND REGULATIONS.

THIS Institution was first established in 1818, and incorporated by Royal Charter in 1828, for the general advancement of mechanical science and for promoting the acquisition of that species of knowledge which constitutes the profession of a Civil Engineer. It consists of four classes, viz. Members, Associates, Graduates, and Honorary Members. To be admitted a Member, the candidate must be more than twenty-five years of age, have been regularly educated as a Civil Engineer, or had employment for five years in responsible situations as Resident Engineer, or otherwise, in some of the branches defined by the Charter as constituting the profession of a Civil Engineer, or must have practised on his own account in the profession of a Civil Engineer for at least five years. Associates are persons of more than twenty-five years of age, who are not necessarily Civil Engineers, but whose pursuits constitute branches of engineering. Graduates are persons, not under eighteen years of age, who have not been less than two years in the office of an Engineer, and whose papers and drawings have been well considered, with a view to determining their fitness for election. Honorary Members are either distinguished individuals, or persons eminent for science and experience connected with engineering, but who are not engaged in the profession in Great Britain or Ireland. The Officers of the Institution are a President, four Vice-Presidents, and twelve other Members of Council, who constitute the Council to direct and manage the concerns of the Institution; also two Auditors of accounts, a Treasurer, and one or two Secretaries; they are elected annually. The President, Vice-Presidents, and ten of the other Members of Council are from the class of Members; the other two Members of Council from the class of Associates. The Auditors are from the class of Members or Associates.

The Ordinary General Meeting takes place on the second Tuesday in January, when the Council present a list of persons whom they nominate as suitable for the offices of President, Vice-Presidents, and other Members and Associates of Council. The President, Vice-Presidents, and Members and Associates of Council, are elected annually. No Member can be elected to the office of President more than two years consecutively, and is not re-eligible for that office for three years. The senior Vice-President in duration of office is nominated for President, except he has given notice to the Council of his intention to decline the office. In case of the decease or resignation of the President, the Council are empowered to summon a Special General Meeting, and to proceed to the election of a President. The Treasurer, Secretary or Secretaries, Collector, and all other officers necessary for conducting the business of the Institution, are appointed annually by the Council.

The resident Members pay four guineas, non-resident Members three guineas each per annum. The resident Associates pay three guineas, non-resident Associates two guineas and a half each per annum. The resident Graduates pay two guineas and a half, non-resident Graduates two guineas each per annum. New Members and Associates pay an admission-fee of three guineas; but Graduates do not pay any admission-fee until they are transferred to the class of Members.

The President must necessarily be a person eminent as a Civil Engineer, and who is required to take the chair at all Meetings of the Institution, the Council and the Committees, at which he is present. The Council consists of the President, the four Vice-Presidents, and twelve other Members of Council. The Secretary is appointed every year by the Council, on the Tuesday after the Annual General Meeting, and who is required to reside at the Institution, and conduct the correspondence, and attend all Meetings.

The Session commences on the second Tuesday in January, and continues till the end of June. The Annual General Meeting of the Institution is held on the third Tuesday in January; and the Ordinary General Meetings are held on every Tuesday during the Session, with the following exceptions: the third and fourth Tuesdays in January, Easter Tuesday, and Whit Tuesday.

The Library is open daily to all Members, Associates, and Graduates, from 9 A.M. to 9 P.M., when they have the right to peruse and inspect all Books, Papers, Plans, Maps, &c.

THE SOCIETY OF ARTS.

THE Object of the Society is the encouragement of the Arts, Manufactures, and Commerce of the country, by means of public Exhibitions and Meetings, and by bestowing medals, honorary and other rewards, for meritorious works in all departments of the Fine Arts, especially those of a decorative and ornamental character, and for Discoveries, Inventions, and Improvements in Agriculture, Chemistry, Mechanics, Manufactures, and any other useful Arts.

The Society awards special prizes for the best designs, exhibiting a union of good art and manufacture, and also for the best compositions, whether painted or modelled, to be employed in architectural decorations, &c. Other prizes (being strictly educational) are awarded to students of a certain age, the Society's aim being to educe a class of students who shall be prepared to enter into successful competition for the prizes previously mentioned. The Society has also established a class of rewards to those manufacturers who produce original and beautiful works. There are thus several distinct classes of prizes to promote Decorative Art.—Class 1. For Students. Class 2. Medals and Money Rewards for matured artists producing decorative designs worthy of the Society's sanction. Class 3. Medals and Honorary Rewards to artisans and workmen. Class 4. Medals and Honorary Testimonials to manufacturers producing beautiful works. In order to prepare the way for the establishment of a National Periodical Exhibition of British Art and Manufactures, the Society commenced in 1847 an Exhibition of Manufactures illustrating the application of decorative design, which was visited by nearly twenty thousand persons—that of 1848 was visited by more than seventy thousand. In addition to these objects, the Society awards prizes for discoveries and communications relative to the products of the Colonies.

Every Member whose contribution is not in arrear is entitled—

To be present at and to take part in the proceedings of all the ordinary meetings of the Society, and to introduce two friends as visitors at such meetings.

To be present and vote at all general meetings of the Society.

To have personal free admission to all exhibitions.

To have, gratis, a copy of every part or volume of the Society's Transactions published subsequently to his election.

To be present at the meetings of the five standing special committees.

To introduce, either personally or by note addressed to the Secretary, any number of friends to inspect the models, paintings, and works of art in the Society's House, between the hours of ten o'clock and four on any day from

the 1st of October to the 31st of August, except Sunday and Wednesday, and such other days, and under such restrictions and conditions, as the Council may direct.

To the use of the Society's Library, and to borrow books therefrom, under such regulations as the Council shall from time to time prescribe.

The annual contribution of members is not less than two guineas, or in lieu of all contribution, a composition of not less than twenty guineas.

Corresponding Members are entitled to attend, but not to vote at general or ordinary meetings.

LIST OF PRIZES OFFERED FOR THE SESSION 1848-9.

A GOLD MEDAL, offered by his Royal Highness the Prince Albert, for the best account of any NEW and IMPROVED MACHINERY or PROCESSES employed in the cultivation or preparation of Sugar in the British Colonies, designed to economize labour and increase production. Attention is especially to be directed to the more perfect extraction of the juice from the cane, to the simplest and most effective apparatus for boiling and preparing the sugar, also to the comparative qualities of the crushed cane, when used as manure or when used as fuel. The effect of railways and other modern improvements, and the comparative expense and efficiency of Steam and Water Power on production and cost should also be investigated, and in each case the special circumstances of each colony or estate should be specified.

A GOLD MEDAL, offered by his Royal Highness the Prince Albert, for the best CEMENT for UNITING GLASS, particular attention being paid to perfectly cementing Glass Pipes or Glass Roofing. It must be clearly understood that this Prize will not be awarded unless a cement should be produced which will bear the strongest tests and trials.

Prize of FIFTY GUINEAS, offered by T. Twining, Jun., Esq., for the best series of EXPERIMENTAL RESEARCHES on and Specimens of the APPLICATION of SLAG, or other allied products, to new purposes, useful or ornamental.

1. STUDENTS.—Prizes (in money or books) for the encouragement of studies for Decorative Design; the object of these prizes is to promote that careful mode of early study which the Society considers essential to success, and most conducive to the interest of art and manufactures.

For the best ORIGINAL STUDIES from NATURE (either Cartoons or Models), size of life, unless otherwise expressed, of the following:—1. Of a Group of Hands and Feet, with characteristic action. 2. Of a Group of Hands and Feet, with characteristic action, engraved in line, quarter-size. 3. Of a Head of a Child. 4. Of a Head of a Child, engraved in line, quarter-size. 5. Of a Draped Figure from Nature, two feet high. 6. For the Head of a Camel, Lion, or Bear. 7. Of an Owl,—of a Swan,—of an Eagle, or Vulture, front view (not less than half-size). 8. Of the Hop, and the Bindweed or Convolvulus Major, and the Red-berried Bryony. 9. For the best Group of Oak and Ivy Leaves, arranged together ornamentally. 10. For the best studies of Twelve British Wild Plants in their natural growth. 11. For the best drawing of an Ornamental Arrangement of the Honeysuckle and Passion Flower. 12. For the best drawing of the Human Skeleton, quarter-size. The successful candidates in this class will be called upon to attend and give specimens of their competency before the Committee.

2. DESIGNERS.—1. For the best Chalk or Monochrome Drawing, being an original composition, of CHILDREN, half life-size, for a semicircular compartment—the *Silver Medal* and *Five Pounds*. 2. For the best Chalk or Monochrome Drawing, being an original composition, of FIGURES, half life-size, to fill a spandrel of an equilateral arch of two centres—the *Silver Medal* and *Five Pounds*. 3. For the best Cartoon, being an original composition, of a group of the ROSE, SHAMROCK, and THISTLE, arranged ornamentally—a *Silver Medal* and *Three Pounds*. 5. For the best arrangement of the HOP as a Paper-hanging—*Silver Medal* and *Two Pounds*. 5. For the best Drawings of a series of BRITISH WILD FLOWERS, to be treated for printing on China as ornaments—the *Silver Medal* and *Five Pounds*. 6. For the best original Design for a STAINED GLASS WINDOW, to suit a room or passage in the Italian style of architecture—the *Silver Medal* and *Ten Pounds*. 7. For the best ornamental Design suitable for PRINTING ON A DINNER-PLATE—the *Silver Medal* and *Three Pounds*. 8. For the best original Design and Working Drawings for a CHANDELIER, to be executed in Metals, Glass, and China combined; scale, quarter

full-size—the *Silver Medal* and *Ten Pounds*. 9. A Design for an ENCAUSTIC TILE, pattern in the Italian style—the *Silver Medal* and *Three Pounds*. 10. For the best Design, taken from British Flowers, for a SHAWL PATTERN, to be woven in colours—the *Silver Medal* and *Five Pounds*. 11. A Design and Working Drawings for a PENDENT HALL LAMP, for Gas—the *Silver Medal* and *Five Pounds*. 12. For a new Design of a Glass DECANTER and WINE-GLASS, not cut—the *Silver Medal* and *Five Pounds*. 13. For a new Design for a TEA-TRAY, to be executed in Papier Mâché—the *Silver Medal* and *Five Pounds*. 14. For the best coloured Design, in Tempera, for a BRUSSELS CARPET, for a Dining-room—the *Silver Medal* and *Three Pounds*. 15. For the best coloured Design, in Tempera, for a BRUSSELS CARPET, for Drawing-room—the *Silver Medal* and *Three Pounds*. 16. For the best Design for a SILK DAMASK, in three colours—the *Silver Medal* and *Three Pounds*. 17. For the best Design to be stamped on UTRECHT or FURNITURE VELVET—the *Silver Medal*. 18. For the best Design for a large GARDEN VASE—the *Silver Medal*. 19. For the most elegant Design for a VASE in red Earthenware, to be ornamented with Designs taken from English History or Literature, in the manner of Etruscan Vases—a *Gold Medal*. 20. For the best ornamental Design for an OPEN-WORK PANEL in Cast or Wrought Iron, and suitable for an Entrance Gate—the *Silver Medal*. 21. For the best Working Model of an original Design for a SILVER GOBLET, suitable to be awarded as a prize value One Hundred Pounds, in conformity with the bequest of the late Dr. George Swiney; the decorations to be emblematical of Justice—the large *Gold Medal* or *Twenty-five Pounds*. 22. For a Model of a TABLE-LAMP PILLAR—the *Silver Medal* and *Five Pounds*. 23. For a Model of a SALAD-BOWL—the *Silver Medal* and *Three Pounds*. 24. For a Model of a TEA-URN or TABLE TEA-KETTLE, with Working Drawings, full-size—the *Silver Medal* and *Ten Pounds*. 25. For a Model of a TABLE CANDLESTICK, to be executed in Metal by dies—the *Silver Medal* and *Five Pounds*. 26. For a Model of an ORNAMENTAL CASE for a Chimney-piece Clock—a *Gold Medal* or *Twenty Pounds*. The successful Candidates in this Class will be called upon to attend and give specimens of their competency before the Committee. All Designs, &c. competing in Classes 1 and 2 must be sent in on or before the first Monday in January, 1849.

3. ARTISANS.—1. For the best specimens of WOOD CARVING, the production of an Artisan (male or female) who is not a wood carver by profession—two *Silver Medals*. NOTE. The object of this prize is to encourage wood-carving (which is a home occupation) as a means of employment subsidiary to other occupations. 2. For the best executed GROUP OF ROSES, painted on Glass or China—the *Silver Medal*. 3. For the best nude FIGURE of a BOY, painted on China—the *Silver Medal*. 4. For the best specimen of CHASING of the HUMAN FIGURE, in Brass, produced within the preceding six months—the *Gold Medal*; for the second best specimen—the *Silver Medal*. 5. For the best specimen of CHASING of the HUMAN FIGURE, in Silver—the *Gold Medal*; for the second best specimen—the *Silver Medal*. 6. For the best and most elaborate specimen of SILK-WEAVING—the *Silver Medal*. 7. For the best specimen of DIE-CUTTING of the Human Figure, for stamping Metals for ornamental purposes; the dies to be produced—the *Gold Medal*. The successful Candidates in this Class will be called upon to give an actual specimen of their competency before the Committee.

4. MANUFACTURERS.—Medals of Gold or Silver, and Honorary Testimonials, will be given to Manufacturers and others who shall exhibit at the Society's House, in the year 1849, fine and original specimens of the following British Manufactures, recently executed, to be sent in on or before the first Monday or Tuesday in February.—A gilt Frame of the best gold colour. Shawl Weaving. Printing for Shawls. Calico Printing. Carpet Weaving. Ribbon and Silk Weaving. Chintz Printing. Paper-hangings. Iron and Brass Casting, applied to ornamental purposes. Metal Figure Casting. The most beautiful novelty in Earthenware, Marble, and Slate. Fine Art in Translucent China Screens. Printing and Colouring on China. Ornamental Cutlery. Largest specimen of perfect Electrotype Figures. Best specimen of Crimson on China. Best work of Art applied to Paper-hanging. The most beautiful novelties in Papier Mâché. All specimens, &c., competing in Classes 3 and 4, must be sent in on or before the first Monday and Tuesday in February. The Society deem it necessary to state, that its rewards are not limited to the subjects specified, but that rewards will be given to other meritorious works in all branches of art.

5. ARCHITECTURAL DESIGN, &c.—For the best Design for a LABOURER'S COTTAGE in the country—the large *Gold Medal* or *Thirty-one Pounds Ten Shillings*. The Drawings to comprise a general plan, elevation, and section, drawn to a scale

of three-eighths of an inch to the foot, together with the requisite working drawings to a larger scale and a general specification of the internal finishing and fittings proposed. The Design must provide a living-room, a scullery, and three bedrooms. Presuming that in structures of this description, where the outlay must necessarily be very limited, both with a view to economy of material and likewise to external effect, it will be considered desirable that the Cottages should be erected in pairs, the wall between them containing the flues; in such cases the details of one only will be required. It is necessary that consideration should be given, firstly, to the most convenient arrangement of the parts; secondly, to the best means of ventilation, drainage, supply of water, cleanliness, and economical heating; and lastly, to combine therewith the most pleasing and picturesque effect attainable with reference to the limited outlay. The cost of a Double Cottage erected in Middlesex, when completed with the requisite landlord's fixtures, must not exceed £200. All Designs in competition for the above premium must be sent in on or before the first Monday in January, 1849.

6. AGRICULTURE.—1. For the best Essay on the MODE of ARRANGING and CONSTRUCTING a FARMSTEAD, Homestead, and the complete requirements of an Agricultural Establishment for 300 acres, comprehending the best system of convenient arrangement of the Farm-yard and Offices, as to draining them most simply and economically, and especially with reference to the reception of a Steam-engine capable of performing the various duties of threshing, cleansing, bruising, cutting, grinding, and steaming with economy, safety, &c. The Essay to be illustrated with drawings or models, to show what degrees of picturesque effect might be given to such design, subservient to strict economy, and a Specification, describing the materials such buildings would be constructed with, and the reasons for their propriety. Separate drawings of the elevations of the Homestead and Offices, section of the ground-plans, and plans of the liquid manure tank and drains are required—the *Gold Medal*. 2. For the best Paper, founded on experience, for CLEARING MEADOWS and PASTURE LANDS from the places commonly called Fairy-rings, and also from Buttercups, Blue-bells, Dandelions, and other noxious weeds—a *Gold Medal*. 3. For the best practical Essay on the NATURE and HABITS of INSECTS affecting the Farmer, with the most approved method of preventing the destruction usually committed by them—a *Gold Medal*. 4. For the best Paper on MOLES, ROOKS, and SPARROWS, setting forth the good or ill they do; whether they should be encouraged or destroyed—a *Gold Medal*. 5. For the best Paper on the subject of AGRICULTURAL STATISTICS, showing the nature of the information most desirable to be obtained, and the method by which it may annually, or oftener if required, be collected and published by the Government. A full and detailed account of the scheme, and the officers and machinery by which such collection is proposed to be made, with an estimate of its cost, either in gross or at per acre, for parishes or districts, will be required—a *Gold Medal*. 6. For the best Essay on the Application of LIQUID MANURE, illustrated by practical examples, with full details of the plans for constructing the tanks and distributing the liquid—a *Gold Medal*. 7 For the introduction into Field Culture of a PLANT as a SUBSTITUTE for "Carthamus tinctorius," or Dyer's Saffron, with the result of the cultivation in this country of at least a quarter of an acre. Samples of the flowers (not less than 14lb.) made up into cakes, with a specimen of Silk dyed with the same, to be forwarded to the Society—a *Gold Medal*. 8. For the introduction from abroad of any Improved AGRICULTURAL IMPLEMENTS—a *Gold Medal*. 9. For an Account of any GRAIN or PULSE, imported from foreign countries since 1840, which has been found a profitable Food for Farm Stock—a *Gold Medal*. All claims for the above Premiums must be addressed to the Secretary, and delivered in at the Society's House on or before the second Monday in January, 1849.

7. COLONIES AND TRADE.—It is absolutely necessary that in all claims for the following Premiums the statements made by Candidates residing in the Colonies should be authenticated by the certificates of the Governor or Secretary of the colony, or by two justices of the peace, or other competent local authority.

1. For the IMPORTATION of any NEW PLANTS likely to be useful as substitutes for the POTATO—a *Gold Medal*. 2. For the IMPORTATION of any NEW SUBSTANCES which can be successfully used as substitutes for CAOUTCHOUC—a *Gold Medal*. 3. For the best Samples of COTTONS produced along the western coast of Africa; specimens to be produced to the Society both in seed and picked—a *Gold Medal*. 4. To the person who shall grow and prepare in the East Indies, or in any British colony, the best specimen of TEA, of good marketable quality. Samples, amounting to at least two pounds, with certificates that not less than one hundredweight of

equal quality has been prepared and imported into Great Britain, to be produced to the Society, together with full information as to the mode of growth and preparation—a *Gold Medal*. 5. For the best application of MACHINERY as a substitute for manual labour in the various processes of cultivation and manufacture of Sugar, Cotton, and Coffee—a *Gold Medal*. 6. To the person who shall raise the greatest quantity of FLAX, of good quality, in any of the British possessions in the East Indies or Australasia, being the produce of not less than five English acres. Certificates of the number of acres cultivated, the mode of culture, the nature of the soil, and weight of the produce, together with fourteen pounds of the Flax, to be forwarded to the Society—a *Gold Medal*. 7. To the person who shall import at least two tons of any VEGETABLE FIBRE which shall be equally cheap, strong, and durable, and applicable to all the purposes for which HEMP is now used—a *Gold Medal*. 8. To the person who shall produce in any British Colony and shall import the greatest quantity of SILK proper for manufactures, not less than one hundred pounds weight. Specimens of the Silk, not less than one pound, with an account of the method by which the Silkworms were managed, the kind of trees or plants whence they were furnished with food, and particulars respecting the culture of the trees or plants producing it, to be forwarded to the Society—a *Gold Medal*. 9. To the person who shall import the finest quality of Silk produced in the East Indies, equal to the best Italian or China Silk. One pound of the Silk to be sent to the Society as a sample, with certificates that at least one hundred pounds of equal quality have been imported—a *Gold Medal*. 10. To the person who shall manufacture and import the finest specimen of OIL, not less than ten gallons, the produce of OLIVES grown in any British Colony in Africa or Australasia. Specimens of the Oil, not less than two quarts, together with satisfactory certificates, to be produced to the Society—a *Gold Medal*. 11. To the person who shall import the finest WINE, not less than one pipe, of good marketable quality, made from the produce of Vineyards in Australasia. Samples of the Wine, and certificates that it was made in the colony, to be produced to the Society, together with an account of the Vineyards, and of the process of manufacture—a *Gold Medal*. 12. To the person who shall prepare in any British Colony or Possession, and import into Great Britain, the greatest quantity, not less than one hundred pounds, of DRIED FRUITS, of good quality, similar to those now imported from the Mediterranean. Satisfactory certificates that the Fruits were grown and prepared in the colony or possession, with samples, to be sent to the Society—a *Gold Medal*. 13. For the importation or introduction into this country of any new Plants or Trees, from China, India, or elsewhere, producing OILS or FATTY SUBSTANCES, such as can be used as FOOD, or are applicable to manufacturing purposes—a *Gold Medal*. 14. For the best sample of any new ornamental WOOD suitable for the manufacture of Furniture—a *Gold Medal*. Claims for the Premiums in the section of Colonies and Trade to be sent in on or before Christmas, 1850.

8. MECHANICS.—1. For the Plan of a ROOF, composed of Wood and Iron, circular or octagonal, to cover the largest area without Pillars, with details, specification, and estimates, and the cubic quantities of timber, with the weight of wrought and cast iron employed—the *Gold Medallion, the Acton Premium*. 2. For the Design of the arrangements for the INTERIOR of a BUILDING to accommodate the largest audience with the most perfect arrangement for hearing—a *Gold Medal*. 3. For the best Essay on the means by which the ROOFS and WALLS of large buildings may be constructed so as to prevent Echoes or sounds that would interfere with the voice of a speaker, also pointing out the position in which the speaker should be placed so as to be heard by the largest number of persons—the *Silver Medal*. 4. For the best Design for a CONSERVATORY, to be executed in carpentry, combining firmness and strength of construction with lightness and elegance of form; the structure to be suitable for the Gardens of a Botanical or Horticultural Society, and adapted to the present improved state of the glass manufacture—a *Gold Medal*. 5. For the best Design for a WATER-METER to measure and register the quantity of Water supplied to private houses, breweries, or manufactories, so that the consumer may pay for the quantity taken at per 1,000 gallons, without using a cistern. The design must not be too costly to prevent its general application, and it must not be liable to be deranged or tampered with—a *Gold Medal*. 6. For the best collection of DIAGRAMS (with explanations) to illustrate the action of the forces on a Crank or Cranks turned from a horizontal direct action Steam Cylinder or Cylinders, the effect of various proportions of connecting-rods, and degrees of expansion of steam being shown—a *Gold Medal*. 7. For the best Design for a Wrought-iron PISTON for Steam Cylinders of large diameter—the *Silver Medal*.

8. For the best Paper on the causes of OSCILLATION in RAILWAY LOCOMOTIVES at high velocities, and on the principles and expedients by which that source of danger may be removed—a *Gold Medal*. 9. For the most simple and efficient FIELD GATE—the *Silver Medal*. Communications sent in for competition in this Section should be delivered at the Society's House not later than the second Monday in January.

9. CHEMISTRY.—1. For any material improvement in the manufacture of CROWN GLASS, with special reference to the transparency and durability of surface—a *Gold Medal*. 2. For FLINT GLASS FREE FROM VEINS, as dense and transparent as the best now in use, and quite fit for the purposes of opticians—a *Gold Medal*. 3. For the best account of the Causes of the DEFECTS in FLINT GLASS, with the means which have been employed to remedy the same, accompanied by suggestions for the improvement of the manufacture—a *Gold Medal*. 4. For the best set of Experiments on any white METALLIC ALLOY that can be usefully applied to the Arts, or hard enough for use in reflecting Telescopes, and casting it free from microscopic faults. Samples of the Alloy, and of the metals of which it is made, to be produced to the Society. The properties of the Alloy particularly requiring notice are, fusibility, non-liability to tarnish when exposed to damp air, or to be acted on by ordinary fluids, the tenacity, the cohesive force, the compactness or porosity, the colour, and the degree of polish of which it is susceptible—a *Gold Medal*. 5. For the discovery of a SUBSTANCE capable of receiving the CALOTYPE or TALBOTYPE IMAGE. It should be absorbent and chemically neutral to the action of nitrate of silver, acetic, and gallic acids, and the iodide of potassium; it should be at least as transparent as paper (or more so, if possible), even in texture, and free from a granulated surface—a *Gold Medal*. 6. For the best method of DYEING WOOLLEN YARN in the HANK, so as to stand the process of Milling—a *Gold Medal*. 7. For an arrangement by which ELECTRIC TELEGRAPHS would be protected from the influence of atmospheric electricity, sea water, &c., and rendered capable of being worked during the most powerful Aurora Borealis—a *Gold Medal*. 8. For a method of REFINING VEGETABLE OILS, by a quick and cheap process, so as to render them fit for burning in lamps, and for lubricating machinery. A sample of not less than five gallons to be forwarded to the Society—a *Gold Medal*. 9. For the discovery of a GLAZE for EARTHENWARE and CHINA, equal to the glazes ordinarily used by manufacturers, but produced without the use of lead—a *Gold Medal*. 10. For the best series of specimens of OPAQUE ENAMELS, suited to artistic or manufacturing purposes—a *Gold Medal*. 11. For the best series of specimens of TRANSPARENT ENAMELS, suited to artistic or manufacturing purposes—a *Gold Medal*. Claims for Premiums in this Section must be accompanied with full descriptions, certificates, and samples, and should be delivered to the Secretary, at the Society's House, on or before the second Monday in January, 1849.

LIST OF PRIZES AWARDED, SESSION 1847-8.

To Mr. Alderman COPELAND, M.P., for the combination of fine art with manufacture exhibited in his specimens of Porcelain and China—the *Isis Gold Medal*. To Messrs. MINTON & Co. for the novelties in fine art produced in their various exhibited manufactures—the *Isis Gold Medal*. To Mr. T. SEDDON, jun., for the best drawings of an original design for an Ornamental Carved Sideboard—the *Silver Medal* and £20. To Mr. S. BENDIXEN, for the best Monochrome Drawing for a Circular Compartment, being an original composition, half-life size—the *Silver Medal* and £5. To Mr. W. SMITH, for the best model of a Bracket to support a figure two feet high—the *Silver Medal* and £5. To Mr. B. FARMER, for the best cartoon of an arrangement of the White Lily for a decorative purpose—the *Silver Medal* and £2. To Mr. BATSFORD, for his specimen of Hand Carving of the Hawk and Butcher-bird—the *Silver Medal*. To Messrs. COLLMANN & DAVIS, for the ornament and workmanship of their Marqueterie Table—the *Silver Medal*. To Mr. J. A. HATFIELD, for his Bronze Chasing of the figure of Dorothea and other works—the *Silver Medal*. To Mr. F. HUNT, for his reduced model of the Laocoon—the *Silver Medal*. To Mr. MAGNUS, for his application of Enamel Colours to Slate—the *Silver Medal*. To Messrs. MINTON & Co. for the best specimen of Turquoise Blue on China, not affected by acids—the *Silver Medal*. To Mr. PRATT, for producing a fine work of very large size in Pottery—the *Silver Medal*. To Messrs. H. B. & J. RICHARDSON, for the beauty and purity of their Glass, and for the merit of their works in Engraved Glass—the *Silver Medal*. To Mr. J. F. CHRISTY, for his application of Enamel Colours to Glass—the *Honorary Testimonial*. To the COALBROOK

DALE IRON COMPANY, for the excellency of its Iron Castings—the *Honorary Testimonial*. To Mr. HALL for his mode of discharging colour from Marble, and giving it the appearance of relief without destroying the surface—the *Honorary Testimonial*. To Mr. HETLEY, for the brilliancy of colour produced in his specimens of Stained Glass—the *Honorary Testimonial*. To Messrs. HOLLAND & Co., for the workmanship of their Marqueterie goods—the *Honorary Testimonial*. To Messrs. JENNENS & BETTRIDGE, for their skilful use of the material in their manufacture of Papier Mâché, and its application to many new purposes—the *Honorary Testimonial*. To Messrs. MESSENGER & Co., for the excellence of their Iron and other Metal Castings—the *Honorary Testimonial*. To Messrs. PHILLIPS & WYNNE, for their Wood and Ivory Carving—the *Honorary Testimonial*. To Messrs. STUART & SMITH, for the beauty of construction and workmanship displayed in their Grate, and the novelty of combining metal with encaustic Tiles—the *Honorary Testimonial*. To Messrs. WILLOCK & Co., for their application of Terra Cotta to purposes of ornament—the *Honorary Testimonial*. To Master B. WEBB, for the front views of the head of a Ram, of a Bull, and of a Horse— a *Prize of Books*. To Master C. P. SLOCOMBE, for a group of Oak and Ivy Leaves, arranged together ornamentally— a *Prize of Books*. To Mr. T. WOODINGTON, jun., for a group of Oak and Ivy Leaves, arranged together ornamentally—a *Prize of Books*. To Miss M. A. SHACKLETON, for the best study of twelve British Wild Flowers—a *Prize of Books*. To Mr. H. MAYE, for his combined design for a Finger-plate and Lock Furniture to match—a *Prize of Books*. To Mr. T. C. HYNE, for the superior degree of merit exhibited in his design for a Labourer's Cottage—a *Prize of £15*. To Mr. S. J. NICHOLL, for the superior degree of merit exhibited in the plan and arrangements of a Labourer's Cottage—a *Prize of £10*. To Mr. J. COLSON, for the superior degree of merit exhibited in his design for an intermediate Railway Station—a *Prize of £10*. To Mr. C. B. ALLEN, for the merit of the designs on the Panels of a pair of Folding Doors—a *Prize of £10*. To Mr. L. W. COLLMANN, for his design of an Ornamental Carved Sideboard—a *Prize of £5*. To Mr. T. BROWNE, for his drawing of Figures, half-life size, for a circular compartment—a *Prize of £3. 3s.* To Mr. H. FITZ COOK, for his design for a Chandelier—a *Prize of £2. 2s.*

To Mr. R. C. CHAWNER, for his essay on the comparative merits of thick and thin Sowing—the *Isis Gold Medal*. To Mr. G. CREE, for his essay on the treatment of Forest Trees where early pruning has been neglected—the *Isis Gold Medal*. To Mr. SLOCUM, for the introduction into this country from America of various Agricultural Implements—the *Silver Medal*. To Mr. T. S. TYSON, for his Sackholding Barrow—the *Honorary Testimonial*.

To Mr. A. GYDE, M.R.C.S.E., for his essay on the causes and prevention of Mildew—the *Isis Gold Medal*. To Mr. T. ROSS, for his method of preserving Daguerreotypes from the injurious action of light and air—the *Isis Gold Medal*. To Mr. NAYLOR, for his mode of manufacturing a new Yellow Turpentine Varnish —the *Silver Medal*. To Mr. KIDD, for his sample of Olive Oil from Australia—the *Silver Medal*.

To Dr. POTTS, for his pneumatic process of Pile-Driving—the *Isis Gold Medal*. To Mr. PRATT, for his improved Landing Pier for tidal rivers—the *Isis Gold Medal*. To Mr. E. ALLEN, for his mode of forming a communication between the Guard and Driver of a Railway Train—the *Isis Gold Medal*. To Mr. YATES, for his improvement in the construction of Lever Watches—the *Silver Medal* and *Honorary Testimonial*. To Mr. CUNNINGHAM, for his carriage for facilitating the conveyance of Life-Boats from one part of the coast to another—the *Silver Medal*. To Mr. W. STANLEY, for his design for a Timber Swing Bridge—the *Silver Medal*. To Mr. MILTON, for his improved Drill for miners—the *Isis Medal* and *£3. 3s.* To Mr. HELEY, for his flexible Floating Cylinder for the preservation of Life from Shipwreck—the *Isis Silver Medal*. To Mr. WOODS, for his Chess-board for the Blind—the *Isis Silver Medal*. To Mr. JENNINGS, for his improved Water-Tap—the *Honorary Testimonial*. To Mr. CRACKNELL, for his improved Wrench—the *Honorary Testimonial*. To Master BURSILL, for his improved Soldering-Iron—a *Prize of £2*.

Among the several MODELS in the Museum of the Society we select the following, as more peculiarly applicable to the object of our publication.

1805 Geometrical Quadrant—R. Salmon
1814 Instrument for Drawing lines in Perspective—J. Farey.
1816 Instrument to Measure Angles—T. Barber.
1817 Improved Instrument for laying down Angles—W. Hall.
1817 Improved Parallel Ruler—G. Wood.
1841 Stretching Frame for Drawing Paper—S. Colton.
1819 Tracing Instrument—D. Napier.
1835 Parallel Motion for Steam-engine —J. Dodds.
1835 Method of communicating a Rotary Motion—T. Bochin.
1847 Machine to indicate the Speed of Railway Trains—M. Ricardo.
1841. Mercurial Safety-Valve for Steam-engines—R. M'Ewen.
1836 Instrument to drive Screws inside Tubes—Prof. E. Solley.
1810 Tachometer to ascertain the Velocity of Machinery—B. Donkin.
1838 Furnace for Type-founders—W. Levick.
1846 Apparatus for drilling and tapping Gas or Water-pipes—G. Scott.
1796 Metal Rope or Chain—W. Hancock
1809 Metal Rope or Chain—G. Gilpin.
Archim. Screw-drill—J. M'Dowal.
1841 Model for Tinning Sheet-copper—T. Weeks.
1848 Improved Solder-Iron—M. Burdill.
1848 Improved Drill for Mines—J. Mitton.
1827 Improved Lathe-Chuck—J. Bower.
1826 A German Boring-Bit—E. Donkin.
1795 Machine for Cutting Piles under Water—J. Fouids.
1794. Machine for Sawing Marble—J. Fulter.

MODELS IN BODY OF ROOM.

Direct Printing Telegraph—H. and E. Highton.
Enamelled Rod of Iron, used instead of wire at the points of supports in tunnels —H. and E. Highton.
Coils of a Telegraph Instrument burnt by lightning.
Phono-Mechanical Telegraph.
Copper Wire for Telegraphic Purposes—F. Whishaw.
Three-wire insulated Electric Telegraph Rope.
Self-sustaining Battery—Hart.
Engine Counter—J. Richmond.
Railway Break—R. Wrighton.
Patent Water Meter—E. Haigh.
Long-boiler Steam-engine—R. Stephenson, C.E.
Case of standard Measures and Gauges for Engineers—Whitworth and Co.
Atmospheric Pile-driving Machine—Clarke and Varley.
Throttle Valve—J. Wood and Co.
Regist. Gas-valve—Bryan, Donkin, & Co.
Indicating Steam-gauge—J. Wood & Co.
Model of the Tubular Bridge at Conway, 400 feet span—R. Stephenson, C.E.
Model of Engines of 500-horse power, fitted to her Majesty's ship "Samson" —G. and J. Rennie.
The Archimedean Screw Propeller—Mr. Seaward.
Two Models to show the Action of the Screw—Mr. Seaward.
Self-tilting Well Buckets—Tasker & Co.
Tile Machine—W. B. Webster.
Parlor Printing Press and Type Case—Holtzapffel and Co.
Gauge for measuring the Tires of Railway Wheels—Joseph Fenn.
Lamps for Miners—Crane.
Model of a method of removing centres of Arches—R. Williams.
Revolving Iron Safety Shutters—Smith and English.
Albion Printing-press—S. & T. Sharwood
Columbian Printing-press, invented by the late George Clymer—R. and T. Sharwood.
Columbian Print.-press—Clymer, Dixon, and Co.
The Reaction Air-wheel, a substitute for the ordinary windmill—Robert Ross.

PART III.

Original Papers.

JURISDICTION AND PRACTICE

Of the Court of the Vice-Warden of the Stannaries of Cornwall.

BY H. S. STOKES, ESQ.

The Court of the Vice-Warden is of great antiquity, and it now exercises the common-law jurisdiction which for centuries was vested in the Stewards of the Stannaries, and whatever common law or equitable jurisdiction the Vice-Warden of the Stannaries formerly possessed. Those who are curious to inquire into the extent and nature of the powers anciently held by the Stewards and the Vice-Warden, are referred to Mr. Smirke's report of the case of Vice *v.* Thomas, determined on appeal before his Royal Highness Prince Albert, the present Lord Warden of the Stannaries, and the collection of records and documents which Mr. Smirke has appended to his report, with valuable notes and illustrations. The object of this article being to describe briefly the present jurisdiction of the Vice-Warden, and the practice of the Court, it may suffice to state, in reference to the origin and authority of the Court, that it is founded on immemorial customs, declared from time to time by Convocations of Tinners, and confirmed, defined, and extended by Royal Grants and Acts of Parliament.

In the year 1835 the Court, which had for some time been in abeyance, was remodelled and almost reconstituted by the legislature. An outline of the more important statutory provisions

will, therefore, be given; to be followed by a description of the persons and matters within the jurisdiction of the Court, and some account of the proceedings of the Court and the mode of appeal to the Lord Warden.

I. The statute that most affects the Stannaries is the 6 & 7 Wm. IV., c. 106, by the first section of which it is declared that it shall be lawful for the Duke of Cornwall for the time being, if of full age, or his Majesty and his successors, King or Queen regnant of England for the time being, if there be no Duke of Cornwall, or if the Duke of Cornwall for the time being is under age, to appoint from time to time a fit person, being a barrister of at least five years' standing, to be the Vice-Warden of the Stannaries.

By the fourth section of the same Act it is enacted, that the original equitable jurisdiction theretofore lawfully exercised shall thenceforth be exercised by the Vice-Warden for the time being, not only in respect of tin and tin mines, to which it was formerly confined, but "in all matters and things brought before him, so far as relates to the working, managing, conducting, or carrying on of any mine worked for any lead, copper, or other metal or metallic mineral within the said county of Cornwall, or to the searching for, working, smelting, or purifying of any lead, copper, or other metal or metallic mineral, within the said county, in as full and ample a manner as if the same had related to any tin or tin ore, or tin mine, or mine worked for tin in the said county."

By the fifth section it is provided, that it shall be lawful for the Vice-Warden to rehear and vary his own decrees, orders, and acts, and that the Lord-Warden shall have power on appeal, with the aid of three or more members of the Judicial Committee of the Privy Council, to affirm, alter, or reverse the decrees, orders, or acts of the Vice-Warden, and to dismiss the appeal with costs or otherwise, as may seem just; and that the judgments of the Lord Warden shall be subject to appeal to the House of Lords.

By the sixth section the common-law courts of the Stannaries are consolidated into one court, to be held before the Vice-Warden; and the seventh section declares that the Vice-Warden shall have and exercise the same common-law jurisdiction and the same power and authority in all matters brought before him in any way connected with the working, managing, conducting, or carrying on of any mine worked for any lead, copper, or other metal or metallic mineral in the county of Cornwall, or the searching for, working, smelting, or purifying of lead, copper, or any other metal or metallic mineral in the county, in as ample a manner as if the same had been connected with or related to any tin or tin ore or tin mine, or mine worked for tin; and the right is given to any party, plaintiff or defendant, to appeal against any judgment, order, or sentence, to the Lord Warden, who, aided by three or

more members of the Judicial Committee of the Privy Council, may affirm, alter, or reverse any such judgment, order, or sentence, or dismiss the appeal with costs or otherwise, as may be just; but it is declared that the Court of Appeal shall not reverse, alter, or inquire into any judgment of the Vice-Warden, except only for error of law apparent on the record, and that every judgment of the Lord Warden shall be subject to an appeal to the House of Lords.

The Vice-Warden is enabled by the eighth section of the Act to grant a new trial in any action at law, on the same grounds as new trials are granted by the courts at Westminster; and if he shall think that an impartial trial cannot be had in Cornwall, he may direct the record to be sent to the Judges of Assize for the county of Devon, who are then to try the cause.

Sections nine and ten relate to the service of subpœnas, which may be effected in any part of England, and enforced by process from the Queen's Bench, provided expenses be tendered to witnesses.

Where judgment has been obtained, and the person and effects of a defendant cannot be found within the jurisdiction of the Court, the Judges of the Superior Courts may, under the eleventh section, issue a writ of execution to the sheriff of any county, city, liberty, or place, against the person or goods of the party; and, by the twelfth section, any rule of the Vice-Warden's Court which cannot be enforced by reason of the nonresidence of a party within the jurisdiction, may, on a certificate from the Registrar of the Court and an affidavit of the facts, be made a rule of any one of the Superior Courts, and enforced accordingly.

The thirteenth section declares that the Vice-Warden and his Court shall not have or exercise any power or authority save as provided by the Act, and that any person proceeded against may plead or demur to the jurisdiction, within fourteen days after appearance entered, by filing a statement of the grounds of the demurrer or plea with the Registrar of the Court, and serving a copy on the person proceeding, or his solicitor or attorney.

By the fourteenth section the Vice-Warden is empowered to make rules and orders respecting the rules and proceedings of the Court, such of them as apply to the equity side of the Court to be approved by the Lord Chancellor of England, and those which affect the common-law side to be approved by a Judge of one of the Superior Courts of common law at Westminster, the old practice of the Court, however, to continue until, and except so far as it is annulled or altered by the Act or the rules so to be made. In exercise of the power given by this section, several important rules of practice have been made with the sanction of the authorities referred to, and found to work most advantageously.

The fifteenth and sixteenth sections give powers to the Vice-

Warden to order how evidence shall be taken, and to regulate other matters of practice; and the seventeenth section enables him to make orders by way of injunction or otherwise, whether in or out of the county, and though the Court may have been adjourned, and declares that the Court shall be at all times open for the entry of pleadings, orders, proclamations, and process, except on Sundays, Christmas-day, Good Friday, and days for public fast or thanksgiving. The Court, consequently, will always, except on the days mentioned, be found open at Truro from ten in the forenoon till two in the afternoon, and application may, whenever necessary, be made to the Vice-Warden through his secretary for orders for injunctions, rules *nisi* for sale of shares, and other process requiring his sanction.

By the eighteenth section the Vice-Warden is enabled to order the sale of the share held in a mine by any person against whom a decree or order may have been made for payment of money due in respect of the working or management of, or the providing goods for, such mine.

The nineteenth section declares that the ancient seal of the Stannaries shall be the seal of the Court.

The twentieth section provides that barristers and attorneys and solicitors may appear and plead in the Court; and the twenty-first section gives to the Court jurisdiction throughout Cornwall, declares it to be a Court of Record, and enacts that its sittings shall be held at Truro as often as necessary, at least once in every three calendar months, on such days as the Vice-Warden may appoint.

The twenty-second, twenty-third, twenty-fourth, and twenty-fifth sections relate to the appointment of the Registrar and other officers of the Court, and the salaries of the several functionaries. The Registrar is a most important officer of the Court, as he unites the duties of a Master in Chancery and those of the masters in the Superior Courts of common law. He sits from day to day at Truro, and when not engaged in drawing up orders, decrees, reports, and other routine matters, he is occupied in taking disputed accounts between pursers and shareholders, and in investigating and allowing the claims of creditors on mines of which the machinery and materials may have been ordered to be sold for payment of the creditors. The post has, since the reconstitution of the Court, been most ably filled by William Michell, Esq., a barrister of many years' standing, who combines with sound legal learning a thorough knowledge of the mining usages and transactions of Cornwall. All the other appointments which have been made under these sections have been equally judicious, and have given great satisfaction to the county.

Provision is made in subsequent sections for raising the salaries of the judge and officers; one half of which is charged on the revenues of the Duchy of Cornwall, a third of the fees of the

Court being paid to the Receiver-General of the Duchy in aid of this contribution by the Duchy; and the other moiety is obtained from the residue of the court fees, and by an assessment of one farthing in the pound sterling on all metals, except tin, sold within the county. By another statute tin ore is declared equally liable with other ores to this assessment. Should the balance in hand at any half-yearly audit of the Vice-Warden be found sufficient to pay the salaries for the ensuing half-year, the Vice-Warden is directed to make no assessment on metals during such half-year. If managers of mines omit to make returns to the Registrar of the Court of all metals and metallic minerals sold, or to pay the amount of the assessment, they are subject to a penalty not exceeding £50 for every such offence.

Sections thirty-two, thirty-three, thirty-four, and thirty-five, refer to the qualification, number, and mode of summoning jurors.

By the thirty-seventh section the Vice-Warden and Registrar are prohibited from practising in any court of law or equity.

The next material section is the fortieth, which substitutes the county gaol at Bodmin for the ancient and dilapidated Stannaries prison at Lostwithiel.

The forty-first section enacts that the powers heretofore vested in the Vice-Warden, or any Steward or Judge of the Stannaries, shall be exercised by the Vice-Warden.

A very important provision is contained in the forty-second section, which enacts that it shall be lawful for the Court of Queen's Bench at Westminster, on application of any party to any action on the common-law side of the Vice-Warden's Court, on special cause shown by affidavit, that an impartial or sufficient trial cannot be had in the Court, to remove the proceedings by writ of *certiorari*, and to deal with and make such regulations respecting the same, and the trial of the cause, as to the Court of Queen's Bench may seem meet.

The last material section of this Act is the forty-third, which declares that all acts, statutes, laws, liberties, privileges, customs, rights, usages, and freedoms, in force in the Stannaries of Cornwall at the time of passing the Act, shall have the same force and effect as if the Act had not passed, except so far as the same are contrary or repugnant to the laws of the realm, or inconsistent with, or annulled, repealed, or altered by, the Act, or by means of the powers and authorities given by the Act.

The next statute affecting the Court is the 2nd & 3rd Vict., c. 58, the first section of which extends the assessment of one farthing in the pound to tin and tin ore gotten in Cornwall, and gives the collector of the assessment a small increase of salary.

By the second section, jurors who attend the court of the Vice-Warden are exempted from attending the County Sessions for the period of one year from the date of such attendance.

In the third section it is declared that no appeal by reason of the Vice-Warden granting or refusing a new trial shall be allowed to a defendant where the damages found by a jury do not exceed £20, and that no appeal which shall be allowed against any judgment, order, or sentence, given in the Court of common law of the Vice-Warden shall operate as a stay of proceedings, unless the appellant shall give security for the satisfaction or performance of the judgment, order, or sentence appealed against, if the same be affirmed, and for payment of the costs attending the appeal.

Similar security for costs is required by the fourth section of the Act on appeal to the Lord Warden against any decree, order, or act of the Vice-Warden on the equity side of his Court.

The fifth section confers on the Vice-Warden enlarged powers to make rules and orders respecting the practice of the Court, and the sixth enables the Registrar to take depositions and affidavits.

Provision is made in the seventh section for adjourning and holding the Court, should the Vice-Warden be prevented by illness or accident from attending at the time appointed for his sittings, and for the appointment of a deputy for a limited time on sufficient cause being shown.

The eighth section empowers the Vice-Warden or Registrar in certain cases to discharge persons in custody for contempt or other cause, and the ninth section confers some additional authority on the Registrar.

The tenth and last section of this Act does not affect the Vice-Warden's Court, but contains a most important enactment, for which the county is indebted to the present Vice-Warden. It declares the offence commonly called "kitting" in Cornwall; that is, the taking, removing, or concealing of ores by tributers or other workmen in mines, with the intent to defraud the adventurers or any miners or other workmen, to be felony punishable as simple larceny.

The next Act affecting the Vice-Warden and his jurisdiction is the 7 & 8 Vict., c. 105, being the very important statute passed for the purpose of confirming and enfranchising the ancient Assessionable Manors of the Duchy of Cornwall, and to quiet titles within the county of Cornwall, as against the Duchy. By the thirty-ninth section of this Act it is provided that one part of the triplicate award of the Commissioners appointed under the Act shall be lodged among the records of the Vice-Warden's Court, and that the Registrar of the Court shall permit inspection and furnish copies at moderate charges named in the Act.

By the fifty-sixth section of the Act the Vice-Warden is entitled on petition to determine disputes between the Duke of Cornwall or his lessees, or any person authorized by him to enter upon and work mines, &c., in lands or tenements within the manors

mentioned in the first and second schedules of the Act, and any person claiming compensation for damage; and the fifty-seventh fifty-eighth, and fifty-ninth sections provide for the application of the amount of compensation in certain cases.

In the sixty-first section it is declared that any persons intending to work mines in the same lands (other than waste lands) shall before such entry, if so required by the person interested in the surface, deposit at least £20 with the Registrar of the Vice-Warden's Court, or enter with one or two sureties, approved by the Registrar, into a bond to the Registrar for the same amount, the deposit or bond to be held as security for payment of the compensation that may become due for damage, and costs of recovering same; and as often as the amount of damage shall equal or exceed the sum so deposited or secured, the Vice-Warden is required, on application of the person interested in the land, by injunction to stop further workings till the amount of previous costs and damage shall have been paid, and a further deposit be made or bond given for £20, to be applied as before provided.

The sixty-second and sixty-third sections provide for the course to be adopted on the determination of possession and other events, and the sixty-fourth section enables the Vice-Warden to make orders as to the application of the moneys in the hands of the Registrar, and the costs of proceedings under the Act.

Another statute which affects the Court of the Vice-Warden is the 11th & 12th Vict., c. 83, by the seventh section of which it is enacted that the number of jurors shall be five instead of twelve in actions for the recovery of any debt not exceeding £20, or such other sum as shall hereafter be determined by Act of Parliament to be a small debt within the jurisdiction of the County Courts.

It is enacted by the ninth section that it shall be lawful for the Vice-Warden to appoint a competent number of bailiffs for the service and execution of all process on the common-law side of his Court, and process of attachment in equity, and it extends to the Court, in several particulars, the enactments of the 7 & 8 Vict., c. 19, being the Act for regulating the bailiffs of inferior courts.

The tenth section makes provision for the protection of the bailiffs so to be appointed; the eleventh section declares that on the office of the prothonotary of the Court becoming vacant, the Vice-Warden shall appoint two persons as clerks of the Court to perform the duties of that officer; and the twelfth section, in order to protect the several officers of the Court and those who aid them in the performance of their duties, declares that actions against them shall be commenced within three months after the committing of the act or grievance complained of, and regulates the pleadings in such actions.

There is one other statute, passed in the last session of Parliament, 11th & 12th Vict., c. 45, commonly known as the "Joint Stock Companies' Winding-up Act," which operates with very questionable effect on Cornish mines, its provisions being expressly declared to apply to all associations or companies formed for the purposes of working mines or minerals; and it is apprehended that this act will be found, ere long, in some respects to supersede the jurisdiction of the Vice-Warden's Court, or, at all events, to bring that Court into collision with the Superior Courts of Equity, notwithstanding the proviso contained in the second section of the statute, that nothing in the act shall affect the jurisdiction of the Court of Stannaries in Cornwall. The manner in which the statute has already been found to operate on adventurers in Cornish mines demands serious attention from those who represent Cornish interests in Parliament; and it is hoped that the ill-considered application to mines in general of a measure that should be confined to Joint Stock Companies will lead to some legislative enactment for the better regulation of mining companies, the enforcement of the payment of mine-costs, and the winding-up of mining accounts. Some of the clauses of the statute to which these observations apply indicate the practicability of such a measure as that which has been suggested; and, strengthened as the members for Cornwall now are by the recent addition to their body of a gentleman of great experience in mining concerns, in the person of Mr. Humphry Willyams, who has just been returned for the borough of Truro, it may be confidently expected that in the coming session of Parliament an attempt will be made to simplify and improve the law relating to mining companies. The success of such an endeavour would be of equal advantage to the Court of the Vice-Warden and to the Superior Courts.

II. As to the persons and matters within the Vice-Warden's jurisdiction, it may be stated, as a general rule, that those who come under the description of "miners" may sue and be sued on the Common-law side of the Court for almost all causes of action, except such as involve title to land; but on the Equity side of the Court the personal privilege and liability do not prevail, and suits there should be confined to mining transactions. The term "miners" is considered to comprehend mining adventurers, mining agents and labourers, merchants, and others who gain their livelihood principally by supplying materials, machinery, or other articles necessary for the working of mines.

It is in Equity that the jurisdiction of the Vice-Warden is most valuable; and since the appointment in 1835 of the present Vice-Warden, John Lucius Dampier, Esq., who had for many years been a distinguished member of the bar on the Western Circuit, judicial decisions have been given in the Court on many

of the most important legal questions arising out of mining adventures, and illustrating the customs of the county. But one opinion prevails in Cornwall, that the appointment as Vice-Warden of a gentleman of such high legal attainments, and such extensive acquaintance with the peculiarities of the county, was a public boon. The crude and anomalous practice which had for many years existed in the Court has been, by the assiduous exertions of Mr. Dampier, aided by the Registrar, reduced into shape, while the jurisdiction has been defined, and the principles recognised in the Superior Courts have, so far as was practicable, with due regard to local circumstances, been introduced and applied.

A main part of the business on the Equity side of the Court consists in enforcing the rules and usages commonly called the "Cost-Book System" of working mines, which probably originated in Cornwall, and has prevailed there for centuries. That system implies, that when a number of persons have determined to form a company for working a mine, they meet, and in a book called the Cost-Book enter, or cause to be entered, their names for the shares they respectively intend to hold; after which they decide what workings shall be carried on, and appoint mining agents to conduct the necessary operations, and another and most important officer called "the Purser," whose duties are to keep the Cost-Book, and there enter the accounts of the mine, to pay and receive moneys on account of the mine, and to collect the amounts due from shareholders for costs. This agent is, for many purposes, considered to be the representative of the whole of the shareholders. The resolutions, embodying these matters, having been passed and entered in the Cost-Book, are subscribed by the adventurers.

The costs attending the adventure are fairly entered in the same book as they arise; and at stated intervals, usually every two months, the adventurers meet to audit the accounts, receive reports from the agents, and decide on further operations. A resolution allowing the accounts, and other necessary resolutions, are then passed and subscribed by the adventurers; and it is to be remembered that the signatures should always either actually or by proxy, on proper stamp, represent a majority of the shares held in the mine. In the same book notices of transfers and of relinquishments of shares ought also to be entered, so that every shareholder may be able at any time to ascertain, without difficulty, with whom he is adventuring, and the proportion of his interest in the undertaking.

Where a mine is thus conducted, the Purser is enabled by the laws of the Stannaries to sue any adventurer, whether resident in or out of Cornwall, for his proportion of the costs so audited and signed, by a petition to the Vice-Warden. The petition, when the defaulter resides in Cornwall, is served on him per-

sonally; and when he resides out of the jurisdiction, the service is effected by affixing copies of the petition and the summons which accompanies it to the door of the account-house, or some other conspicuous place on the mine. The defendant may by his answer deny or admit the allegations of the petition, or allow a decree for payment to pass, *pro confesso*, without putting in an answer. If an answer is put in, denying the allegations of the petition, the plaintiff must establish them by producing the Cost-Book, and by proof of the signatures of the shareholders who have passed the accounts, with evidence that the defendant was and continues to be a shareholder. A decree for payment of the debt, with costs of suit, at a time stated, having been obtained either in the way described or *pro confesso*, an order *nisi* for sale of the shares held by the defaulter is afterwards procured, which may ultimately be made absolute; and the shares are then sold under the direction of the Registrar, and the proceeds applied towards satisfaction of the Purser's demand, the costs of suit, and the expenses of sale. If the proceeds be insufficient to cover these claims, the defaulter may, if he reside in the county, be attached and sent to the county gaol, and there detained till the decree is satisfied.

Petitions of this kind are amongst the most numerous of the suits on the Equity side of the Court; and the other most frequent form of petition is equally peculiar and necessary to Cornwall,—namely, the Creditor's Petition against the Purser of a mine for the amount due for labour, agency, or supplies. Every labourer, agent, and person engaged at a mine in performing services necessary for a mine, and every person supplying machinery, materials, and other articles required for the use of a mine, has by the custom of the county an equitable lien on the ores, halvans, engines, machinery, materials and effects upon and belonging to such mine, for the amount due for any such labour, agency, or supplies; and the Vice-Warden will, on the hearing of a petition of this kind, if satisfactory proof be given of the justice of the demand, order payment of it, with the costs of suit, to be made by the Purser at a time stated; after which, if default has been made in payment of the sums ordered to be paid, an order *nisi*, and ultimately an order absolute, for the sale of the ores, halvans, engines, machinery, materials and effects of the mine may be obtained, when the same are sold under the direction of the Registrar, and the proceeds distributed among the petitioning creditor and the other creditors of the mine. If the proceeds should prove insufficient to pay their demands in full, the creditors receive an equal dividend on the amount of their respective claims.

Another suit peculiar to the Court is the petition frequently presented for the revocation of unexpired mining setts, where mines have ceased to be worked, or have been worked inefficiently.

Formerly, tin bounds furnished a fruitful source of litigation in the Court, and questions relating to that peculiar kind of property were tried on petition to the Vice-Warden sitting in Equity, which should more properly have been tried at common law; but owing to the supposed unsettled state of the law as to tin bounds, no proceeding has for some years been instituted in this Court respecting them; and, indeed, since the decision on appeal in the case of Vice *v.* Thomas, before referred to, it would seem doubtful whether title to tin bounds can now be tried on the Equity side of the Vice-Warden's Court, as formerly was done. The judgment in this case, however consonant with the principles and practice of the Superior Courts, seems of very questionable propriety with reference to the peculiar customs of Cornwall; and has put an end to a mode of determining disputes concerning tin bounds which was at once simple, efficient, and inexpensive.

The space allotted to this article precludes further detail of the peculiar matters within the equitable jurisdiction of the Vice-Warden; and with regard to the general equitable jurisdiction of the Court, it may suffice to say, that it embraces most of the matters relating to mining transactions and mining companies which could properly be the subject of a suit in a Superior Court of Equity.

III. For the mode of proceeding in the Court, reference should be had to a small volume published at Truro, embodying the two more important Acts of Parliament which have been already cited at some length, and the rules and orders for the regulation of practice and pleadings. It may be sufficient here to state that the process and pleadings on the Common-law side of the Court resemble those of the Superior Courts of common law, except in actions for the recovery of debts not exceeding 20*l.*; the time for appearing, declaring, pleading, and other proceedings, being regulated so as to accord with the periods at which the sittings of the Court take place. In actions for recovery of debts not exceeding 20*l.*, the process is by plaint and summons, and without formal pleadings.

The mode of proceeding on the Equity side of the Court is invariably by petition, in the nature of a bill in Chancery, but without its prolixity. The answer to it must be in writing, but is not taken on oath, and must confess or deny all the allegations in the petition, which, if not confessed, it would be necessary for the plaintiff to prove, the defendant being liable to pay the costs incurred by the plaintiff in proving the allegations which have been denied or not confessed.

The costs attending the proceedings, and the trial or hearing of causes, on either side of the Court, are regulated by scales which have received the sanction of judges of the Superior Courts, and are such as should satisfy the most rigid legal economist.

Appeals from the decisions of the Vice-Warden to the Lord-Warden must be lodged with the Secretary of the Lord-Warden within six weeks from the date of the decisions appealed against; after which, they are argued by counsel before the Lord-Warden, assisted by three or more members of the Judicial Committee of the Privy Council. These appeals were formerly attended with great delay; but since the appointment of his Royal Highness Prince Albert, they have been heard and determined with not less promptitude than judicial ability. The expense of an appeal is inconsiderable; yet, though the spirit of litigation is far from being inactive in Cornwall, applications for reversal of the judgments of the Vice-Warden are very rare, their infrequency showing how largely the Vice-Warden possesses the confidence and respect of the many litigants in his Court.

ON

THE UTILITY OF A KNOWLEDGE OF ENGINEERING, GEOLOGY, MINERALOGY, AND METALLURGY,

IN PURSUIT OF PRACTICAL MINING.

BY PERCIVAL N. JOHNSON, F.R.S., F.G.S., ETC.

THOSE who have had any experience in the development of the hidden riches of the earth, and compared the rude operations of the ancients with the present mode of working mines, must be struck with the insufficiency of knowledge which they had, as well as the enormously heavy comparative expense of bringing the produce to light for the use of man.

It may be well observed that to the improvements and information of the present day may be attributed our national prosperity and nearly all our luxuries; but no sciences have added so much to these as developing the abundant resources of our mines; and while such comforts are thereby produced, the industrial occupation of man is encouraged and the hearth of the labourer made happy with the heartfelt pleasure that he is eating the frugal meal, the produce of his labours, instead of such wretched scenes as are to be witnessed in Ireland, where such class of men, having no occupation, live a life but little removed from the brute creation, and are useless members of the community.

I make these observations to draw the attention of the reader and the executive of our country, not only in a national but a moral point of view, to the necessity of giving such encourage-

ment to the working of our mineral resources, as, while it must tend to the greatness of the nation, gives employment to the population and encouragement to the ingenuity and intelligence of those employed. Let us then see how this intelligence is to be effected, and the advantages likely to accrue to the community. The miner who has it not is a mere automaton, or animated tool; and in vain has the higher branch of engineering produced by mathematical calculations the majestic engine, or the capitalist expended his money. It is not necessary the miner should be perfect in all the sciences mentioned, but that he should at least have some information in each branch; so that while it renders his occupation interesting it prevents his falling into those errors which render his labour double, if not abortive. I am not one of those who would have the labour of an industrious man interfered with, but by encouraging the ingenuity and intelligence of such men by the circulation of books on the subjects alluded to, and the establishment of mining schools, give them the power of becoming intellectual beings, and render their humble homes peaceful, instead, as is too often the case, the abodes of misery, from want of occupation of the mind. With these observations, let us see the utility of the branches under the different heads.—First,

Engineering, or the Use of Mechanical Power.

To this I must say, as far as material we are indebted to our national resources; what would England be without her coal and iron? Let us see how the so-called mines (or surface-scratchings) of the ancients were formerly worked, either by open cuttings, where the lode or rock was of such a nature as to allow the draining of water to a lower level, or, as in some limestone rocks, to be carried through some subterranean source, or by (as in other localities) sinking a hole, and at great manual labour keeping the water with buckets, and extracting the mineral until prevented by its influx. This in after-times, and perhaps what may be considered as the first step to the use of mechanical power in mines (if it may be so called), was afterwards kept by the flop-jack; but even this could be of little service in comparison with our present extended operations for dressing the ore; even until within the last few years we were dependent on manual labour for breaking copper and lead ores, costing as much to pulverize one cwt. as we can now crush two tons or more; and in returning tin ores, the stuff had to be carried often many miles to some spot where a stream of water was sufficient to work a wheel with some six, eight, or twelve stamps. Let us now see how the power of the engine is brought to bear: mines can be worked to any depth by proper arrangement of pit-work, and in some cases are to nearly the depth of half a mile, thus rendering available mineral productions which, but for this power, must for ever have remained as a constituent part of the earth's surface; the ores are crushed

and stamped by the same power, and enabling poorer class work to be returned from the cheapness of the operation, and giving employment to more than double the hands than were formerly, as well as preventing the injuries occasioned by the old process.

The next subject is the utility of some knowledge of the science of geology. With agents it should form one of essential attraction, and with the underground labourer I may say there is no pursuit which can be found more interesting both as respects gratifying his intellectual faculties, and rendering his labour more productive in point of remuneration; it is in fact from true practical geology that a man becomes a good intelligent miner, his observations being the principles of the science in one branch, without his being aware that they deserve that name: the good tributer judges and gets his "sturts" from observation and certain indications from the joints or dip of the rock, or from some character in the ground which has escaped the observation of the agent. How much more interesting then is his labour if he draw his inferences, and prove by practical illustration the cause of effect,—to know, as so beautifully described by Mr. Hopkins, that the earth's surface has certain electric currents,—to reflect, as shown by Mr. Fox, that these currents are passing through metallic lodes; to observe that the currents are assisted by the intersection of small or large cross-courses or slides, by the moisture exuding from them, and frequently effecting metalliferous deposit; and it may not be considered uninteresting, although requiring some knowledge of chemical action, to pay attention to the cause of the formation of gozzans, as, although not strictly geology, dependent upon a knowledge of that science as a part of the earth's surface. What are gozzans, then, but decomposed iron, or cupreous iron pyrites, and generally containing particles undecomposed? Why do we so frequently find black ore (oxide of copper) among gozzans, and why is this a good indication? Do not let us be satisfied (as too many are) by saying, because we always find it so; but reflect that such black copper proves that the mundic must have been *cupreous* iron pyrites, and therefore indicating the probability of copper deposits in depth of greater abundance, the mundic having decomposed and formed the peroxide of iron and black oxide of copper.

That we may not, however, go too far beyond the point of showing the utility of geological information as regards mining, let me refer to the series of rocks belonging to the coal formation, and, without referring to serious losses of money where trials have been carried out without requisite geological knowledge, let us reflect with what certainty this great natural production may be worked from a knowledge of the rocks of the carboniferous series, and as a matter of exciting interest speculate on the state of the earth's surface when those formations aggregated at a period beyond the knowledge of man. Let us then again refer to

the rocks of the metalliferous deposits. It has been observed, and as a general principle correctly, that rocks of the older formation are more productive of certain metals than others; tin, for instance, being found in granite, or rocks contiguous to it; copper in the clay-slate, although when this alternates with granite, the ore is sometimes found more productive in the latter; lead is found most productive in the limestone, but in this rock seldom contains any silver worth extracting, while lead in clay-slate, if in north and south courses, usually is very productive in silver, and contains small proportions of antimony; and where it exists in east and west courses in the same rock, is not so productive in silver, and is frequently merely the rider or backs of copper lodes. I must here observe with regret, that for want of that knowledge which might be obtained by the establishment of schools of mines, I have known five distinct minerals called elvans by some of our miners, intelligent in other respects than knowledge of geology, while, had they this science for their basis, they would be able to calculate with greater probability on the effects likely to be produced by the intersection of these dykes or courses through the rocks in which the metallic lodes exist.

Mineralogy should form one of the most interesting pursuits of the miner, not merely as collecting a few pretty or glistening specimens, but improving his intellectual faculties by a knowledge of their constituents, which must excite his admiration of the perfection and beautiful order of arrangement of nature; while, unfortunately, too many of our miners only know the various minerals as mundic, jack, copper, tin, white-lead, blue-lead, spar, &c. &c. In a more practical view, the labour of the miner would be considerably decreased if he knew the exact angle of the joints and structure of the rock he intends blasting, by boring the hole at such angle as would break most ground, and the discrimination of rocks which, although mentioned under the observations in geology, would come more properly under the head of mineralogy.

Metallurgy, it may be argued, is not in the province of mining, neither can it be imputed that the labouring miner could afford time to study this science to any extent, but the agents and superintendents of mines would do well to make it their study, first, in giving directions for a proper selection of the ores, in order to a better separation in dressing; and, secondly, avoiding the mixture of (as far as possible) one metalliferous substance with another, so as not to deteriorate the metal produced in smelting. They should also be able to assay or test any mineral that may be discovered, so as to reserve it apart from others, in case it should prove of any value, as it must be well known that many thousands of pounds are lost every year for want of this knowledge, and are mixed with other ores to their injury in point of value to the smelter.

ON THE ECONOMY OF MINING IN CORNWALL.

BY JAMES SIMS, MINING ENGINEER.

At no time of my mining and engineering experience during the last 35 years have I ever known a greater depression in mining in this country than there has been during the last year; and I am sorry to say, that as regards copper, I fear the county of Cornwall has seen her best days; for, having all the world to contend with, in consequence of free trade in that article,—with the spirit of enterprise and discovery, by the great increase of practical miners in this and many other countries,—the great facility of communication with other countries through the agency of steam-power, and which continues to progress to an amazing extent,—I say these things, causing the great and increasing influx of copper ore from Australia, Cuba, Chili, &c. &c., must, at no distant period, be exceedingly injurious to the Cornish miners, unless the calamity can be met by improvements on the present mode of breaking the ores, getting it to the surface after it is broken, and rendering it marketable after it is on the surface, and also in all kinds of machinery connected with mining operations. First, as regards breaking the ground, whether one ground, or otherwise, the present general mode of employment is by contract, known by the terms tutwork and tribute, *i. e.* a certain amount per fathom, which may be broken in a given time, generally in one month, and for tribute, a certain amount deducted from the value of the ores raised in one, two, or more months, by a given number of men. Now it appears to me that this system will admit of considerable and highly important improvements. Competition in many things, no doubt, works well, but in this I am inclined to think it is a great evil to the mining interest. At the account-days or general meetings of the adventurers, it is usual to inquire what wages the men are getting; the book is produced, showing an average amount of probably 50*s.* per month, but I have never yet heard it asked what number of these poor men are getting no more than 10*s.*, 20*s.*, 30*s.*, or 40*s.* per month; and if the greater part of these men have a wife and several small children to maintain? Probably these men, when complaining to the agents of such small amount, and which has been no more for several months, are told, if you had worked as men ought, you would have got fair wages. But I would ask, what can be expected from a half-starved man, who is necessarily unable to do his work, and has the melancholy reflection, when at work, of seeing nothing but misery and starvation before him for himself and family. Not so with those men who are getting so much above the average as others are below the average. They,

although probably men much inferior in strength and judgment, when all are properly fed, are now able to do most work, because they have got the necessary quantity of food to support them. It may be asked, why did these men who are so much below the average get so unable to do as well as others? I would answer, through sickness, or being for some time unable to obtain employment, or in consequence of the alteration of the ground being against them, or other causes. It has occurred to me, that in order to improve this mode of working, and make it better for the men, and very much more economical for the proprietors, I would give every man about 50*s.* per month,—a little more or a little less, according to his capabilities, and boys in proportion, and without any contract; every man would be then paid for his labour, would be able to obtain food for himself and family, and the mine immensely benefited by the very much greater amount of work performed for the same amount of money, and the mine prosecuted with much greater facility; every man would have a living, and would therefore be deprived of an excuse for not having done proper labour; and in order to see this system fully carried out, I would employ overseers, the number in proportion to the magnitude of the mine. They should be steady, well-informed, and experienced miners. Their duties should be, to be one or more underground constantly whilst the men are at work, and to relieve each other as the men relieve; they should, when underground, be constantly visiting the different places, so as to see that each man is doing proper labour, according to the nature of the ground; also to see that no men should leave their work before their comrades come to take their places. A report should be made at least every week, of the quantity of ground broken during that week, the nature of the ground, the names and number of men and boys employed in the different places; also stating whether the air is good or bad; whether or not they have been hindered by water or any other impediment, or in fact any other remark that might suggest itself. I do think, that by such an arrangement, or at least something very similar, a very considerable amount of the misery which I regret to say is now existing throughout the mining districts of this county would be avoided. Under the present system, the ground is set to the men on the setting day, which is once per month, and which is called the tutwork setting, and is for driving, sinking, or raising one or more fathoms or for what they do in a month, or in other words one or more fathoms or the month. The setting day, the men do little or no work; the day after, just the same; these days, together with the pay-day, which is also in a great measure a holiday, are a loss to the mine of considerable importance,—I think little, if anything, short of 10 per cent. of the work which ought fairly to be done. Suppose a mine, employing 500 men, tutwork and tributers, with only three or four agents to attend to all these

men and their operations. Can it be supposed that the ground can be properly examined, in order to know its nature, its constant changes, and at the same time to ascertain whether or not the men are doing proper labour? This question must, I think, be answered in the negative. The consequence of this is, the men will take every advantage to work just as they like. If the ground alter from hard to soft, they say it is useless for us to work harder than to get a little above the average; if we do, we shall have a very much less price next time, and shall be obliged to work very hard (even if the ground remains as it is) to get proper wages. And if the ground change from soft to hard, they say, we will not work hard for nothing; just move along, and at the next setting we shall have a price that will fully compensate for the two months. If the agent, who may probably see the place once in two or three days, say they are not doing proper labour, the answer is, either that the ground is only just changed from hard to soft, and now we will do better, or that the ground has been so very hard since you were here last that we could do no more. The fact is, they know the agents will set to them to get only about 50*s.* per month, and should it happen to be above that amount, their price will be lessened the next time.

Respecting the tribute system, it appears to me to be so pregnant with evils, and in such variety of ways, that it should be avoided as much as possible; and really, when I consider the great number that have been detected in kitting, *i. e.* stealing ore from each other, and also from the adventurers; the combination of parties to assist each other in such depredations,—the one party having a contract for, say 5*s.* out of 20*s.*, of the value of ore he or they may raise, and the other party having 10*s.* and probably the two parties working very near each other; is it not a great temptation for these parties to combine, and to place some of the ore which is broken at 5*s.* with that which is broken at 10*s.*; and as these men have sometimes boys with them, is it not likely to contaminate the rising generation of miners, and to make them dishonest, not only in their work, but when out of their work also? It is a fact well known, that it is the general study of at least this class of miners to deceive the agents respecting the value of the ore ground, especially on the day previous to the setting, or on that day. It appears to me that this tribute system should also be discontinued, and to be substituted either by fixed wages with overseers, or be paid a certain price per ton for the number of tons he or they may break in a given time; but that fixed wages with overseers would be much the best as regards the interest of the adventurers, I have no doubt. It may not be generally known that tribute pitches, as they are termed, are taken, sometimes for one month, and occasionally from one to six months, but I believe rarely above six; and it is [illegible] that in some of these long terms, considerable starts

are made, *i. e.* the taker, probably some little time after he commences operations, meets with ore ground very much more productive than when he commenced, and the result is that he gets a very large sum of money, varying, of course, according to the quantity and quality of the ore, and the time he or they may have in the contract. In a six months' contract, I have known one man to get about 1,000*l.*, which was a loss to the adventurers of more than 900*l.* in six months. These things appear to me to show very clearly that there is room for considerable improvement; and I would remark, that in addition to the mode I have here proposed, of giving every man fixed wages in proportion to their capabilities, I would offer occasionally small premiums, that at the end of the month, if they broke a certain quantity of ore, or had driven or sunk a given quantity of ground, as might be stipulated, they should be rewarded agreeably to that stipulation, and with such premium as might be thought proper. I have never known an experiment of this kind fail of its desired effect.

In all underground mining operations, exceeding care should be taken to properly ventilate the mines, not only for the preservation of the health of the miners, but also to enable them to do proper labour. I have every reason to believe that the great cause of the shortness of life of our miners is, or at least has been, by improper ventilation, or in other words working in bad air. Any places which may be considerably above the ordinary underground temperature should have the benefit of a current of air forced into them by the pumping-engine, or by such other power as might be made available. I think smoking tobacco underground should be strictly prohibited, as it not only induces an idle habit, but also sadly contaminates the air. The best plans, with an eye to simplicity and economy, should be adopted for the descent and ascent of miners to and from their work, for it must be evident that in deep mines the ascending the ladders must be the hardest work and the most injurious. The man-engine at the Tresanean Mine, and also at the United Mines, are very good, but they are so exceedingly expensive as to prevent their general use, and I am inclined to think that these machines have not had the beneficial effect that some more simple and economical machines would have effected. In the coal and iron mines, wherever I have been, they have a stage or platform working in guides, and suspended to chains, where they send down or bring up a considerable number of miners at a time, and except in very few instances, with great safety and very expeditious. The only way in which an accident is likely to occur, is by the breaking of the chain or chains, and this may just as well be made of double the strength, when all danger would of course be avoided.

I think a remark respecting the present tram or railways now

in general use in the mines will not be considered out of place. These things I consider the most defective in all the mechanical departments of mining. The fact is, they are too flimsy, and are fixed in a loose and generally exceedingly careless manner. They are generally bent and twisted in various forms, thereby causing great friction, and consequently much more work for the men and boys to propel the waggons. These rails should be fixed as well in proportion to the weight of carriages working on them as our best railways for steam-carriages; the effect would be, that the power required to propel them would be very much less, the wear and tear of rails and carriages much less, and of course the expense to keep them in repair economised in proportion.

The present mode of boring and blasting in the mines, so far as regards manual labour, is, I think, in a state that can admit of very little improvement, but that at some period not very remote some considerable portion of it will be done by machinery I have no doubt. Above 100*l.* per fathom has been given for sinking engine-shafts in this county, in consequence of the extreme hardness of the ground. Now I am convinced that for such shafts a very portable machine can easily be constructed for beating the borer, which should strike at least three times the number of blows in a given time that it is possible for a man to strike; the power to be obtained from the pumping-engine on the same shaft. The result would be that the ground would be sunk in about one-third of the time, and at an expense that would bear no comparison to manual labour. I would particularly beg the attention of miners to this suggestion. I would remark, that I am now only recommending the plan for shafts, but if first introduced for such purpose, no doubt the well-known ingenuity of Cornishmen would soon contrive it for other departments in mining. In modern mining in this county, the levels are almost, I believe, without exception made much more commodious than formerly; winzes, or shafts sunk from level to level for the benefit of working the ground properly, and for ventilation; cross cuts driven to the right and to the left to cut other lodes. Air-tight boxes, termed sollers, carried on in the bottom of the levels for conveying air to the men, and a railway laid down on the same for the purpose of bringing back the stuff, appear to be improvements of the highest importance, and admit of little, if any, further improvement. Before these commodious levels and air-tight sollers were introduced, they could only drive a very limited number of fathoms, before it was found necessary to have a shaft sunk from the surface or the level above, if any, for ventilation. Now the limit to which a level can be driven without such shafts is not yet known. Respecting the bringing the ore, &c. to the surface, the present mode, by steam power, is very expeditious and economical, and when compared with the mode formerly in use in Mexico and some other parts of the world, of

bringing it up on men's backs, or whether compared with the present mode, I regret to say, too extensively in use, that of drawing the stuff by horses, it shows not only the amazing economy of steam power, but also shows that but for this power it would be quite impossible to work many mines that are now paying large dividends. I have known as much as 2*l.* paid for drawing the same quantity of ore to the surface by horses as is now done by steam power for one shilling. I fear that in many instances the shafts through which the ore, &c. is drawn, do not receive that attention which a matter of such importance requires, and I fear that accidents of rather a serious character frequently occur in consequence of the neglect of the man or men who have the superintendence of this department. The kibble or chain sometimes comes in contact with some projection in the shaft, breaks the chain or rope, and falls with the weight of stuff it contains, the result of which is in many instances exceedingly destructive. Sometimes the chain breaks close to the cage or drum of the engine, and sometimes at a distance of upwards of 100 fathoms from the shaft; the effect of this is, that it admits of no impediment, but sweeps all pulleys, stands, and every other thing before it; of course the loss by such accidents is immense. In this department I would strongly advise that the shafts should be kept in the best order possible; that the chains or ropes should be of the best manufacture, and of increased size in proportion to the depth of the mine, and that none but careful engine-men should be employed. Respecting the dressing department, or rendering the copper, tin, or lead ore marketable, I have no doubt there will be further improvements, but at present have no idea that it can be to any great amount. The next thing to which I would beg to call attention is that highly important and beautiful piece of mechanism, the steam-engine, without whose aid the Cornish mines and miners would be very much less in number than they are at present; and really, when I look back to the time of Savery, of Newcomen, and of Watt, up to the modern improvers of the steam-engine, I look at the most important era in the history of the world. Amongst all the heroes and all the statesmen that have ever yet existed, none have ever accomplished anything of such vast importance to the world in general as have been realized by a few simple mechanics. Sir Humphrey Davy very properly said it is a power by which our mines are drained, our shafts sunk, our ores raised; by which the hand of a child becomes stronger than united thousands; by which the die is struck, the metal polished, the toy modelled; a power whose giant arm twists the huge cable which is to protect the largest ship of the line, and spins the gossamer-like thread which is to decorate and adorn female beauty. Another of our eminent men, in speaking of the steam-engine, says, that amongst the innumerable contrivances of man to administer to the necessities and

to augment the luxuries of life by mechanical agency, none certainly have proved more directly and extensively valuable than the steam-engine. Many great discoveries have been made, involving, indeed, a higher degree of intellectual powers in the cognizance of matter, its laws and properties, as well as a more varied ingenuity as regards its construction and application; but the stupendous effects which, during the short space of one century, have resulted from the application of this power, are striking attestations of the valuable labours employed in the invention. By the agency of steam we are enabled to search into the depths of the earth for its rich productions to an almost unlimited extent. The mariner avails himself of its gigantic power, and the roaring winds and the rushing tides no longer oppose his progress across the wide Atlantic; vast marshes are drained, and land before barren rendered fruitful; communities are brought into closer connection with communities; fresh and inexhaustible sources of comfort and wealth are elicited; new combinations of human industry and ingenuity brought into requisition; knowledge is widely scattered abroad by the extension of letters; distance is lessened by the velocity of locomotion; and time itself becomes more precious and invaluable. Thus, by infinitely enlarging the sphere of useful action to whatsoever was useful before, and by diffusing among millions what previously was only attainable by the few, it has wrought a change of aspect in kingdoms, in commerce, and the individual relations of society, to an extent so wide, and in a time so brief, that the history of the world affords no parallel to it in influence.

It is not only as a prime mover the steam-engine is to be regarded,—collateral branches of the mechanical art have grown out of it, which, in their reciprocating effects, have contributed much to its influence; and thus so illimitable is its adaptability and so obedient to control, that it is made to separate the fine film of the silkworm or to propel our castles on the sea.

That the Cornish steam-engine, or rather the steam-engine as used in Cornwall, is the most economical, is a fact now so generally known that it scarcely needs a remark; but I would say, that although there has been no considerable improvement in duty during the last twenty years, or at any rate very little when compared with the previous twenty years, I still would strongly advise all engineers, especially the rising generation, not to relax in their endeavours to effect further improvements, and if this cannot be effected as regards the principle, simplicity of construction and economy in erection, without any loss of its effective power and usefulness, should have particular attention. This appears to me to be of so much importance in the present state of mining in this county, that I am very much inclined to think that if the Cornwall Royal Polytechnic Society were to offer a premium for the most simple and economical steam-engines

adapted to mining purposes, which include pumping, winding, stamping, and crushing, they would be likely to render great service to the mining interest of this county. Referring to a paper of mine on the rise and progress of the Cornish steam-engine, which was published in the *Mining Journal* of 1st July last, I there noticed the great danger of working the long-stroke single cylinder pumping-engines highly expansive,—at least, as they are now generally constructed. Since that time a very destructive accident has occurred to one of the first-rate single-power engines of 12 feet stroke, in which the expansion principle of steam power has been carried to a greater extent than was ever before attempted in this county in a single-cylinder engine, and in which the economy of fuel by working on that principle has been fully proved, by the duty of the engine being much above any other engine which has appeared on the monthly report. But although the economy of fuel has been so great, there has been a sad contrast in the economy of material, plainly showing that it is by no means safe to work so highly expansive with the present general construction of the steam pumping-engine. In this accident to which I have referred the piston-rod first broke, or rather was pulled asunder, and at the same instant broke the cylinder, steam-case, piston, and cylinder bottom. Of course the working of the engine was suspended for many days, and the loss to the mine was immense. I think this accident alone (although it is only one of a great many which have come under my notice) is quite enough to show that if the economy of mining is to be assisted by working such powerful engines so highly expansive, the construction of the engine should be more suitable to that mode of working. The direct-acting engine is, I think, rather better as regards safety; but there is an objection to it, in consequence of the cylinder being fixed over the shaft, which causes it to incommode the necessary operations. The inverted engine is, I think, much better. This engine has the main beam below the cylinder, therefore the effect of working expansive on the piston-rod and main connection is reversed; thereby rendering the engine safe so far as regards these things if working at the highest rate of expansion. The economy of this engine may be otherwise reckoned as follows: 1st, in price from the manufacturer; 2nd, in the saving of masonry and carpentry work; 3rd, in time and cost of erection; and 4th, in the very much less liability to accident. Judging from the engines that are at work on this plan, I am quite satisfied that this mode of working the Cornish single-cylinder pumping-engine is highly important in point of economy, and I would therefore particularly beg to call the attention of engineers and others to the fact.

Respecting all rotatory engines for winding, stamping, &c., I would recommend their being horizontal; they are equally efficient as regards power and duty, and of course the economy

of laying them down in this way must be very evident. I have paid particular attention to those that are working in this way, and I have not yet been able to discover a single objection to them. For stamping-engines, where a great number of heads are required, say one hundred, I recommend having two engines instead of one as now used. The reasons for this arrangement are obvious,—with two engines there is little chance of there being more than one half the heads idle at a time, but with one engine the slightest accident will cause the whole to be idle.

Small portable engines for the purpose of examining lodes to a limited depth would, I think, add considerably to the economy of mining. It has been a practice which, I believe, began with the commencement of mining in this county,—namely, that of bringing forth an adit level to the lode from some considerable distance, where the surface is much below the surface of where the lode is discovered, probably varying in depth from 5 to 50 fathoms; some are completed in a few months, others take years to accomplish, and at an immense cost. I have known £5,000 spent in such thing, and after all the time and expense, the lode (as many others) turned out to be worth nothing. Instead of all this, if a small portable engine were employed, the lode could be seen equally deep if necessary, and in a time and at an expense bearing no comparison to that of the adit or level. The engine (provided the lode turned out well) might be substituted by a much larger one if necessary, and the small engine applied for winding or stamping; if, on the contrary, the lode should not turn out productive, the engine would no doubt be soon disposed of for a like purpose, whereas the expensive adit would be by no means saleable. I would remark, that if the lode should turn out well, then it might be found to be the interest of the proprietors to make an adit; but I do think that the continuation of this plan of ancient mining, before knowing whether or not it would be useful, and in the face of the great economy of steam power, is a considerable drawback from the great credit attached to the Cornish miner. Respecting the supply of materials to the mines, I believe competition has reduced them as regards price to almost the lowest point of economy; but judging from the very inferior quality I have observed in some of the articles, it would be much to the interest of the adventurers that at every meeting there should be a written report of their quality furnished by the store-keeper, stating the price, from whom received, &c.

In the article grease for pistons and stuffing-boxes of steam-engines, the best tallow is cheapest, as there is frequently in the low-priced grease some very destructive quality, probably some acid, which, if not soon detected, injures the cylinders and piston-rods very rapidly. It first shows itself by decomposition of the softer parts of the piston-rod, and which is seen by a whiteness of the parts affected, and being rough to the touch, almost as if

filed; the cylinder also becomes rough on the inside, destroys the packing, admits the steam through, which adds to the destruction of the cylinder, until at length, as I have seen in two or three instances, the inefficiency of the engine to perform her work is effected. The best means I have known to restore the engine to her original state is to put in some very rough sand, or rather gravel, with the packing of piston, and with a small portion of black lead, together with some best tallow. The gravel scours the cylinder; the black lead, assisted by the tallow, fills up all little crevices, and together soon restore the cylinder to a proper working state. For the rod, some fine sand with the packing is best. In some cases, before the thing became so well known, the loss to some of the mines, by means of the water being in the bottom levels, by the frequent stoppage of the engine to pack the piston and stuffing-box, together with the loss of fuel, hemp, &c., has been immense.

I have certainly spun this epistle to a greater length than I intended, but as there are some important matters mentioned here, however imperfect my suggestions may be respecting them, if any part of these suggestions should in any way benefit the present position of the poor starving miner, and at the same time in some measure economise the present system of mining, it will afford me very great pleasure. That there will be many objections to the mode in which I have proposed to employ the miner, instead of the present by contract, I fully anticipate; but I do say that the miner in the present day is not in a position to take contracts; and that the great evils attending these things are more than are generally thought of, there can be little doubt; amongst which I would name some of the most prominent:—1st, the cutting-down system, as it is termed, *i. e.* taking a tut-work contract at a farthing per fathom, or a tribute contract at a farthing in the pound. Sometimes this arises from some misunderstanding amongst the miners, and is therefore done through revenge; or sometimes to get into a steady place to work, taking the chance of a loan from the mine to support them, or probably having credit from some shopkeeper, or having the means of support in their possession. Now I would ask what quantity of work can it be expected men will do when they get nothing for it, and are obliged to pay the cost of the tools they use? This, certainly, does not look like economy in mining. 2nd, the lending system to miners,—namely, granting them a loan from the mine, when they have little or nothing to receive for work done; the effect of this is, that some worthless men (who I am happy to say are not very numerous amongst Cornish miners) will scarcely do any work, and, after getting considerably in debt, they leave the mine and debt also behind them.

It may be urged that the present system gives every man a chance of having work;—granted; but it does not give to every

one the means of purchasing the necessaries of life. It certainly admits any man into the mine, no matter whether or not he be capable of performing his contract; and I would beg, therefore, to put it to the good sense of adventurers and agents of mines,—which would be most economical for the mining interest, to make choice of men, and give them fixed wages with overseers, as before suggested; or to carry on the present system of contracts, thereby admitting, very frequently, a worthless class of men to take a like portion in the earnings of (I have no hesitation in saying) the best class of working men that have ever come under my notice,—namely, the steady, industrious, and generally well-conducted Cornish miner.

ON THE PRACTICAL APPLICATIONS AND GENERAL INTEREST OF GEOLOGICAL SCIENCE.

BY THOMAS SOPWITH, ESQ., F.R.S., F.G.S., C.E.,

Of Newcastle-on-Tyne and Allenheads.

[The following extract from the concluding portion of a series of Lectures, illustrated by diagrams, models, &c., given on the completion of the restoration of Crosby Hall, by the gentleman whose name is prefixed, conveys an epitome of many of the subjects noticed, at the same time that it presents a useful view of the practical character of geological studies; while we avail ourselves of this opportunity of expressing our obligations for the assistance afforded by Mr. Sopwith in the compilation of the present work.]

WHETHER we contemplate the phenomena of nature or the commercial transactions and domestic comforts of mankind, we shall find them all more or less interwoven with and dependent on geological conditions. The elevation of land above the sea, and the formation of mountain-chains by subterranean convulsions, determine in most instances the *limits of kingdoms*. The *air and climate* of every country are greatly modified by geological structure—by the greater or less area and elevation of land—by the facilities for natural drainage, and the direction of currents of air. The *supply of water* eminently depends on conditions of geological structure as regards the relative position of pervious or impervious strata; and upon the abundance and quality of rocks employed for building purposes depend the *stability, comfort, and duration*, alike of public buildings and private dwellings. The goodness of our streets and roads—the

navigation of our rivers—the safety of our harbours—the right cultivation of the soil—all have an immediate relation to the general geological structure of each district, and to the judicious application of mineral products to the several purposes for which they were destined; and still more obvious and more important is the bearing of geological researches on national economy and national wealth. "If this inquiry," says Dr. Buckland, "should be extended through the endless departments of art, industry, and commerce, which have their origin in the manufactures of metals and in the power of steam, derived exclusively from the application of coal, the vast national importance of mineral statistics and of models—maps and sections, on which alone their details can be effectually recorded—must be apparent to every one."

The study of the practical applications of geology is more or less *within the reach* of every one, and every one *is deeply interested* in this department of knowledge. Great facilities exist even in the metropolis for such studies, which will often be found closely connected with other branches of philosophical research. The beautiful fossils by which different strata are characterized at once gratify the curiosity of youth and present still greater attractions to more matured observation. The notion which many persons entertain of geology being an abstruse and difficult study vanishes before a moderate share of reading and observation. On the contrary, it is a study always at hand, ever soliciting attention, and ever, when attended to, conferring that delight which God has bestowed as a rich reward for the study of His works, and for the peace of mind and true nobility of thought which such pursuits inevitably cherish. The lessons of economic geology meet us in the crowded streets of the town as well as in the lonely valley of the country. A pebble tells of past revolutions of the earth with eloquence as impressive as the boldest cliff or loftiest mountain. The very soil, as we travel across the kingdom, often pictures forth as clear an index to the rocks beneath as do the vivid tints of an artificial map. The landscape-painter, acquainted with the elements of geological structure, observes and delineates characteristic features which escape the untutored eye. The columnar basalt, for instance, is as different in its aspect from broad and massive sandstone strata as the tall columns of Gothic architecture vary from the severe breadth of the Grecian Doric. Guided by the kindred studies of chemistry and geology, the farmer adds new value by giving increased fertility to his land. The architect endues his works with the power of duration by the proper and scientific selection of materials. The sculptor rivals the classic artist in the hardness of material as well as in delicacy of execution; and guided by these useful aids, the miner enters with confident and untiring zeal upon the prudent explorations of those hidden treasures which form the solid foundations of our national wealth.

In the gloomiest recesses of the deepest mines, the light of the sun, which fell in ages long past upon the former forests of the earth, is entombed in the stately fossils which attest the vegetable origin of coal. The burial of these precious and beautiful relics in such profound depths is a subject for contemplation at once impressive and sublime. Immured for centuries in the "lowest darkness and in the deep," they are again brought forth to minister to our wants—to afford the means of active industry to thousands of our countrymen, and to diffuse in many a cheerful and happy home the glowing comforts of an English fireside.

Whether, then, we contemplate the fossil forests of the coal strata, or the brilliant ores and glittering spars of mineral veins —whether we walk over the barren heaths which cover them, or admire the fertile lands which repose on rocks less productive of mineral wealth — whether we ascend the lofty mountain, or travel across extensive plains—in every road, in every brook, in every quarry, we may observe and study some products of the earth, some arrangement of the strata, some subterranean stores applicable to our use, destined in the order of Providence to give employment to the labourer, profit to the merchant, and solid and lasting gratification to all who rejoice to trace the goodness of the Creato in the marvellous beauty of His works.

If rightly applied, nothing is to be wasted—if rightly studied, every object deserves attention. Particles of lead, so small that millions of them only occupy a cubic inch, may be separated from the dross that surrounds them; and in like manner instruction may be gleaned from what at first sight appears the most insignificant parts of the creation. It is by a right application of economy and skill, in connection with geology, that our mineral treasures are to be fully realized. Connected with such studies are all the great features of our distribution in society—our scenery, our commerce, our domestic comfort, our national prosperity. Hence it is that our mining dales and manufacturing districts are densely crowded; while gently swelling hills, rivers laden with mineral produce, and bright and happy firesides, mark the carboniferous tracts of the kingdom. Hence the dreary solitudes, the rugged steeps, the lofty waterfalls and unnavigable streams, where slates and granites, and other older formations, prevail. Whether we examine the cliffs which yield to the fury of the waves, or mounds and beaches of sand which slowly encroach on their dominion, in these, as in every other geological feature, we find materials for intense thought and lasting gratification. The mind is led to inquire, what prepared the fertile soil to yield our food? what upheaved the mountain whose summit, composed of the shells of a former sea, penetrates the clouds? what endued each rock with some

peculiar property adapted for the use of man? what spread those fair and fertile plains, where

> "Peaceful rivers, soft and slow,
> Amid the verdant landscape flow"—

and by what means was science ordained tobe the means whereby we may rightly understand and usefullyemploy the manifold riches which the rocky bosom of the earth unfolds? All nature, with resistless eloquence, proclaims that ALL, from the least to the greatest, is the harmonious work of an Almighty Architect.

If in this spirit, then, we contemplate the structure of the earth, and study to apply its products, with all skill and all economy, to their destined use, we shall derive instruction and delight, as well as profit, from the pursuit. From the observation of such inestimable treasures, the mind is led with gratitude to contemplate, and the heart to offer homage to the beneficent Being whose presiding care sustains and governs all, who, with INFINITE WISDOM AND POWER, has made apparent weakness a source of strength—the seeming disorder and dislocation of rocks the means of rendering accessible their stores of mineral wealth—who, by the agency of rolling waves and vast submersions, has softened down the shattered fabric of the earth's surface—has adorned it with richest scenes of beauty—has filled its fertile vales with fruitful soils, and even in wild and barren hills has poured hidden treasures of precious ores for the service of His creatures.

ON THE DUTIES AND ACQUIREMENTS OF ENGINEERS.

BY EVAN HOPKINS, C.E., F.G.S.

THE duties of engineers are of great importance to the community at large; independent of the immense capital frequently placed under their direction, to carry on undertakings, the lives and safety of human beings often depend on the skill and security of their works, and often in situations presenting great difficulties to examine and ascertain the real causes of accidents. In mines this is particularly the case, and the numerous accidents which from time to time occur in underground operations are a strong reason for insisting on every improvement that can be practically made towards qualifying men to fill such important posts.

There is a great difficulty in effecting so desirable an object by means of the higher degrees of education, or mixed mathema-

tics. Indeed there is, in spite of the accumulated new data, an almost impassable gulf between the physics of the mathematician and those of the practical engineer; and proprietors of works prefer frequently the most uneducated practical man to a theoretical man of science.

Some of our best engineers have been obliged to acquire their useful knowledge from men daily engaged in the respective departments of the profession, and abandon the notions they obtained from their professors; thus, after years of intense application in intricate calculations, they find that it is of little avail in practice, inasmuch as many of the laborious theorems are founded on mere old assumptions, and not on experimental data. Pure mathematics, experimental physics, chemistry, and practical geology are essential acquirements to fulfil the duties of civil engineers, and ought to be obtained as an early systematic instruction, free from erroneous ideas, so that a man of science be universally respected as one of knowledge reduced to a system, and worthy of a responsible practical post. Until, however, engineers and others engaged in experimental physics, by their united labours compel mathematical professors to reform some of their physical creeds, the students will suffer the evil effects complained of.

Within a very limited period in our own history, the profession of engineer was comparatively unknown; now it is universally in the ascendant; it embraces everything which can promote the comfort, the happiness, and the civilization of the human race.

The intelligence, ingenuity, and industry of our practical engineers in connection with our subterranean stores of coal, iron, copper, &c., constitute the principal portion of the real wealth of England.

The greatest engineers, both of the past and present age, have acquired the most valuable part of their education in the workshops, their success and celebrity having been mainly obtained through the strict adherence to the laws of nature and experimental data in preference to those founded on mere assumptions. The prudent engineer fully appreciates the value of mathematics to aid his reasoning, but always keeps geometrical laws wholly independent of physical facts; he knows well that motion cannot be continued without a continual moving force. We cannot discover the fundamental properties of matter without observing and making experiments; after we have once by observation or experiment ascertained things to exist *in fact*, we may then reason, and not before, upon them by means of mathematical laws.

Many of our students have imagined that engineering and physics could be acquired entirely in the academy, and have had their heads so filled with doctrines founded on *assumptions*, that they too often cherish such notions for real and substantial

knowledge; when they come to practice, they find, to their own as well as to their employers' cost, that they have to abandon many of their preconceived notions, and must descend to the mechanical drudgery of experimental inquiry to make themselves fit for their office.

It is by strictly learning the laws of nature, instead of those assumed by theoretical mathematicians, that the English engineer has obtained so much celebrity.

The mining student shares the same fate as others, but in a greater degree; he must receive many lessons underground from the working miner, so as to understand even the true character of rocks and minerals—he will have to learn to separate geology founded on assumption from geology founded on natural laws; otherwise, he can only be but a mere mechanical surveyor, and an ordinary miner would be found superior to him to take charge of such works.

The converse is equally true with regard to the uneducated engineer; however versed he may be in the great laws of nature and practical acquirements, yet, without a moderate scientific knowledge, he will only be fit to fill a post in an ordinary routine. He must not look with an unfavourable view on men of science, because some of them abuse the laws of geometry, and usurp the province of physics by improper inductions. However grand mathematical doctrines may appear as physical generalization, if incompatible with the observed effects of matter, they stand on perishable bases, and must soon be swept away in the progress of true science. The respective laws of terrestrial physics in geology, mineralogy, chemistry, statics, dynamics, and hydrostatics, and the laws of geometry, are unalterable; we only require to comprehend and judiciously apply them, free from the errors arising from human assumption.

The accumulated knowledge of the past and present experience should be carefully preserved for the benefit of the rising generation, and it is time that we should amalgamate the *knowledge of facts* with the acquirements of *pure mathematics*, so that the student may have a more efficient training for the profession.

We fully admit the arguments of many of our practical men, that some of our greatest discoveries and greatest works have been made without the aid of refinement; also, that geological science, as now taught, is of little use to miners. With regard to the first, there can be no doubt but that they have been more or less achieved by the aid of natural science, acquired in the great school of nature, and as the self-taught engineer is always learning during the whole period of his existence, he obtains the very elements which constitute a man of science, and therefore, however unrefined he may appear, he possesses what we wish to obtain for the benefit of the student, *i. e.* practical science, free from both extremes.

We may say the same with respect to geology, that all our intelligent mining engineers who have acquired their knowledge in the mines, are to a certain degree local geologists; the laws of structure, composition, different character of minerals, their accumulations, heaves, &c. &c., are as essential as the tools they employ for the explorations; hence the *true science* of geology should be studied by the mining engineer. This science is abused like others, but that is no reason that its utility should be depreciated.

It is true that in England we have a certain series of sedimentary works, in which coal, salt, &c. have their definite limits, and this has led some geologists to promulgate a certain law of deposition which is totally inapplicable to other parts of the world, and, consequently, the science has been looked at by many as a mere source of amusement; the poor miner of the crystalline rocks below is left, as yet entirely unaided, to his own geological judgment.

The productions of our mines are to us of immense importance; the incessantly improved application of the metals, may be compared to a river, which, by extending its streams, irrigates the soil and spreads fertility. The iron alone of this country has been of inestimable benefit. One glance at the early periods of human history will suffice to impress upon us a due sense of the wonderful changes effected by its application, and this has been effected by the united labours of practical engineers. Iron and coal, through the aid of engineering, are rendered inexhaustible sources of wealth and prosperity to the British empire. The total quantity of coal brought to the surface in Great Britain and consumed annually amounts to about 35,000,000 tons. The total annual value of the British mineral produce is about £30,000,000.

If we reflect that this island is merely the focus of the industry created by British enterprise, and that it branches over other distant parts of the globe, and that capital is often left to the sole judgment of the mining engineer in distant countries; it will be evident that a mere local practical knowledge cannot be sufficient to qualify a man to fill such a responsible situation. The time is now fast approaching when the mere theoretical student on the one hand, or the ordinary practical man on the other, will not suit, and solid practical science, free from both extremes, will be considered as an indispensable qualification for the profession of an engineer in all its branches.

ON THE NEWCASTLE AND DURHAM COAL-FIELDS.

BY MATTHIAS DUNN, ESQ.,

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In submitting the following paper on this important district, it must be borne in mind that the space limited must necessarily preclude much information, with details interesting to the practical miner and collier, but which have been treated on in the works published by me* on the subject under notice, the object on the present occasion being rather to give a popular treatise than to enter into those minutiæ affecting the working of collieries or their results. I am free to confess that the paper is far from perfect in itself, but the object being to portray the most important features of this coal district, and to draw such practical conclusions as to the future which might be calculated to lead others of greater erudition than myself to investigate their truth, and draw from them some general results; if such object be achieved, I shall consider that the time devoted to the consideration of the subject will have been well employed.

Extent of explored Field.

To persons unacquainted with the locality it will be sufficient to say that the area of this coal-field is now well ascertained to consist of from 700 to 800 square miles, comprehending about 600 square miles in the county of Durham, and the remainder in the county of Northumberland.

In the former county, the present explorations are terminated to the southward by the intervention of the magnesian limestone and the new red sandstone, the thickening of which strata appears to bear down and displace the Five-quarter and Main coal-seams, which form the principal subjects in that part of the district.

To the westward, the coal-field is terminated by the outcropping of the seams approaching to the lead-mine district, of Wear Dale, Teesdale, the Derwent, and the Tyne.

In all the other parts of the coal-field it is terminated by outcropping upon the approach to the mountain limestone and the new red sandstone of Cumberland and Berwickshire. The most southerly collieries in the district are those of Castle Eden, Wingate Grange, Hartbushes Trimdon, Little Chilton, Redworth, Cockfield, and Westpits.

* "View of Coal Trade, North of England," 1844; "Winning and Working Collieries," 1848.

The most westerly are those of Crook Medomsley, Mickley, Prudhoe, and Wylam, and the collieries upon the northern margin are those of Radcliffe, Broom Hill, and Acklington, in the neighbourhood of Warkworth, now likely to become important from the completion of the Warkworth Harbour and the Newcastle and Berwick Railway.

The German Ocean bounds the whole of this coal-field to the east, for, owing to the great depth at which the coal lies underneath it,* there have as yet been scarcely any minings executed, although the collieries of Seaham, Monkwearmouth, Harton, &c., contemplate, in the course of time, the prosecution of their operations underneath this *terra incognita*, for the mines of coal, in approaching the sea-shore, for the most part flatten, would lead to the conclusion that the bottom of this important basin is not far distant from the shore.

The seams of coal of a workable thickness throughout this coal-field are numerous, but by no means so thick as in some of the coal-fields of Scotland, Staffordshire, and elsewhere, since from 6 to 7 feet constitute the thickest bed in the series, and many of them are extensively worked of the thickness of 30 to 36 inches.

Identification of Seams.

A circumstance common to all coal-fields occurs in this, and which serves to mystify the identification of the seams, viz., that in progressing from one part of the district to another, they are affected by thickening or thinning, or by the commencement or termination of bands of stone, which unite two seams into one, or separate a thick seam into two thin ones; the quality of these seams is also known to alter, from a caking quality to an open-burning white ash coal, which, together with the dislocation by dykes and the intervention of blanks in the course of exploration, served to confuse and bewilder the best-informed persons in the early stages of this trade; but in this era, when the whole field may be said to be perforated with borings and sinkings, a synopsis has been adopted, the correctness of which may be said to be admitted by the practical viewers; I will therefore subjoin it, for the purpose of drawing observation to the curious classification of qualities in the different districts :—

* At Monkwearmouth Colliery, near Sunderland, at the distance of half a mile from the sea, the coal is working at the depth of 290 fathoms.

SYNOPSIS OF DURHAM AND NORTHUMBERLAND COAL-SEAMS.

No. 1.—Newcastle Division.		No. 2.—Houghton-le-Spring Division.		No. 3.—Tanfield Division.		No. 4.—Walbottle Division, west of Newcastle.	
Fathoms.		Fathoms.		Fathoms.		Fathoms.	
At 20	Monkton Seam	—	Cropped out....	—	Cropped out....		
Further 82	Three-Quarter..	—	Do.	—	Do.		
Do. 30	High Main	At 68	Three-Quarter..	At 36	Shield Row Seam		
Do. 7	Metal Coal ..	Furth. 14	Five-Quarter ..	Furth. 14	—	All cropped out.	
Do. 7	Stone Coal ..						
Do. 10	Yard Coal.....	Do. 11½	Main Coal.....	Do. 7	Brass Thill		
Do. 12	Benaham	Do. 11½	Maudlin				
Do. 15	Six-Quarter....	—	Not in	Do. 28	Hutton Seam ..		
Do. 4	Five-Quarter ..	Do. 10½	Low Main....				
Do. 6	Low Main.....	Do. 14	Hutton Seam ..	Do. 7	Low Main.....	At 11	Main Coal.
Do. 10	Crow Coal	—	Not in	Do. 14	Crow Coal.....	Furth. 10½	Crow Coal.
Do. 9½	Five-Quarter ..	—	Do.	Do. 7	Five-Quarter ..	Do. 3½	Five-Quarter.
Do. 4	Ruler Coal	—	Do.	Do. 4	Ruler Coal	Do. 5½	Ruler Coal.
Do. 18½	Beaumont Seam	Do. 22½	Beaumont.....	Do. 14½	Bustybank	Do. 16½	Engine.
						Do. 15	Stone Coal.
						Do. 3½	Five-Quarter.
						Do. 4	Three-Quarter.
						Do. 9	Splint Seam.

The foregoing table will show how difficult it must have been, under different local names and different characteristics, to identify the various seams in this extensive coal-field, until extensive explorations have at length reduced them to undisputed matter of fact.

Qualities of Coal.

I have already observed that the qualities of the different beds of coal are found to vary in different districts; for instance, the High Main, or Wallsend Seam, which is in the highest possible state of perfection, and 6 feet thick beneath the bed of the Tyne, in proceeding south, is split into two distinct seams of but medium quality, and a similar fate attends it at the distance of 6 miles north, where it is reduced to the height of 3 feet. The Low Main at Cramlington stands upon the highest pinnacle of reputation as an open-burning steam coal; at the river Tyne it is a good gas and smith coal, but in the Wear district it forms the subject of the Hetton and Londonderry Wallsend, or the highest-priced coal for household purposes. Many other examples may be cited, but it will be more important to notice the prevailing quality of each division of the coal-field, as it will serve to illustrate future observations as to the general bearing of this trade.

The prime household coal, then, since the exhaustion of the Tyne High Main, is the produce of the district around Houghton-le-Spring, because of its bright appearance and caking quality; but because it contains a considerable quantity of pyrites and sulphur, it is not highly estimable either for the making of gas or coke.

Coal of a similar quality to this is found in the neighbourhood of Bishop Auckland, but of a less cohesive character. Around Coxhoe, to the eastward of Durham, the Five-quarter and Main coal-seams produce coal of a similar quality, but of a secondary value; and although a hard coal, and samples in large pieces, yet it is not liked for steam purposes, on account of its admixture with pyrites and sulphur.

The Tees collieries in general possess coal of excellent quality, but deficient in value from its softness; but it has of late years become an important locality for the manufacture of coke, the whole produce in many collieries being devoted to that purpose, which is not only exported foreign, but is transmitted up the country by railways into Staffordshire, Lancashire, and much more distant counties. The coke thus made to the westward of Brancepeth is considered equal to any in the kingdom.

Of a similar nature are extensive tracts of coal around Tanfield, where, although distant from the port of shipment 20 or 25 miles, yet depend upon making their return from the manufacture of coke and the selling the coal in its raw state for the production of

gas. The Five-quarter and Main coal are standard household coals.

The tract of country west of Newcastle consists of the lower seams, which are there of good general quality for both house, gas, and coke, but of minor value except for smiths' purposes, the small of which brings more price than that of any other district.

The district north of the Tyne (with the exception of a few collieries working the High Main as second rate) is occupied exclusively in working the Low Main seam as a steam coal, for which purpose it stands unrivalled, and is exported in vast quantities to all parts of the world; and it does but exhibit the difficulty there is in appreciating future events in mining, when I state that until the demand for steam coal took place, this district stood so low in the scale of value, that in one property the whole minerals were purchased for £2,500, which now yield a rental of £4,500 per annum.

Mr. Richardson, an accomplished chemist of Newcastle, has analyzed several specimens of coal belonging to the district, and has obtained the following results:—

	Carbon	Oxygen.	Azote.	Ashes.	Relative Quantity of Heat.
Wylam Splint, West of Newcastle	74·6	6·28	5·9	13·9	110·3
Jarrow Bensham, East of Newcastle	84·8	5·00	8·4	1·7	116·6
Garesfield, Tanfield District	87·9	5·20	5·4	1·4	122·5
South Hetton—Houghton District	83·2	5·20	9·9	2·5	115·0

According to the analyses of Sir H. De la Bèche and Mr. L. Playfair, in 1846, the following results were given of the relative qualities of the inflammable gases:—

	Wallsend Pipe.	Wallsend Bensham.	Jarrow Bensham.	Hebburn Bensham.	Jarrow Low Main	Below Bensham Hebburn Colliery	Jarrow Five-Qr. Seam.	Gateshead Colliery.
Carb. Hydrogen	92·8	77·5	83·1	86·0	93·4	92·7	79·7	98·2
Nitrogen	6·9	26·1	14·2	12·3	4·9	6·4	14·3	1·3
Oxygen	0·0	—	0·6	0·0	0·0	—	3·0	—
Carb. Acid	0·3	1·3	2·1	1·7	1·7	0·9	2·0	0·5
Hydrogen	0·0	0·0	0·0	0·0	0·0	—	3·0	0·0

Peculiarities in this Coal-field.

To those who have perused the pages of my last publication

I can explain nothing new under this head; but as my work was of limited circulation, I will here briefly enumerate some of the most striking features of the district.

Dykes.

Slip dykes are the concomitants of all coal-fields; therefore, as a matter of course, this coal-field is intersected with many such, of the magnitude of 10, 20, and 30 fathoms; but the most stupendous is that called the Main Dyke, which was first ascertained in the Grand Lease colliery, in the neighbourhood of Ryton, and whose course is across the Tyne at Stella, passes through Gosforth, Killingworth, and Backworth collieries, till it enters the sea at Whitley, having previously been split into three or four minor branches.

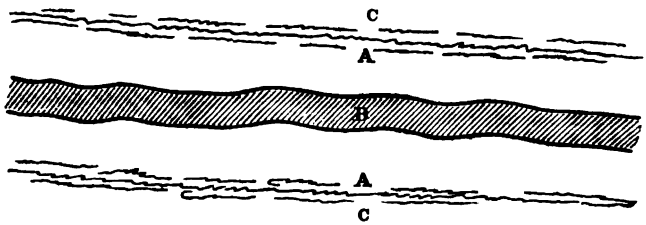
The effects of this dyke, or rather of the dislocation which occasioned it, are manifold; the chief characteristic is the depression towards the north of all the coal strata, to the extent of from 100 to 130 fathoms; consequently, many seams of coal which had the appearance of being cropped out before approaching this dyke from the south, were again deposited many fathoms underground, thereby forming new coal-fields and again becoming the subject of fresh workings; such has been the origin of the extensive collieries of Coxlodge, Gosforth, Killingworth, Backworth, Cramlington, and Cowpen.

It may here be remarked, that this coal-field seems deficient in several species of coal common to other coal-fields, viz., Anthracite; Parrott, such as that at Lismahago, in Scotland; Cannel coal, similar to that of Wigan; brown or wood coal, such as prevail in Dorsetshire; and even the splint and jewel coals of the Lothians do not seem to have any corresponding quality here.

A curious illustration of the above effect is the appearance of a small patch of the magnesian limestone at Whitley, near North Shields, which is entirely separated from the main mass, as exhibited in the hills of Boldon and Cleadon, in the county of Durham, and is adventitiously thrown down here in consequence of the depression which took place at the period of the formation of this dyke.

Many slip dykes of minor importance intersect the coal-field in every part, but as they are but ordinary occurrences, they do not call for further notice than illustrated by the following section.

Several whin or basaltic dykes also traverse the coal-field, the principal of which are the Cockfield, the Whorlton, and the Acklington. These dykes consist of basalt, once in a liquid state, having filled up a chasm in the strata, the said formation being from five to thirty yards in width, and extending downward as far as minings have yet been executed. As a proof of the liquid fiery state in which they were constituted, the coal upon each side is found to be charred to a considerable distance.



A A—represents the Coal coked or cindered for 40 or 50 yards on each side the dyke.
B—the basaltic dyke.
C C—the good coal beyond A A not affected by the dyke B.

The course of these dykes, although lying remote from each other, is remarkably parallel in a course from east to west, and they are all traceable for a great number of miles, holding on in a line nearly straight, but altering in their width and other characteristics; they are not found to occasion such material change in the lying of the beds as the slip dykes, but would appear to have filled up a space or crack in the strata with the then burning lava. The basalt of the Cockfield dyke is specific gravity 2·672, and the charred coal 1·957, that of the coal which it represents being 1·27.

Water.

Generally speaking, the water throughout the coal-field, to a certain depth below the level of the sea, is fresh, but in the collieries to the eastward of the meridian of Newcastle, the lower waters are much more salt than the sea, and at Birtley and Lambton, salt manufactories have been established at these collieries.

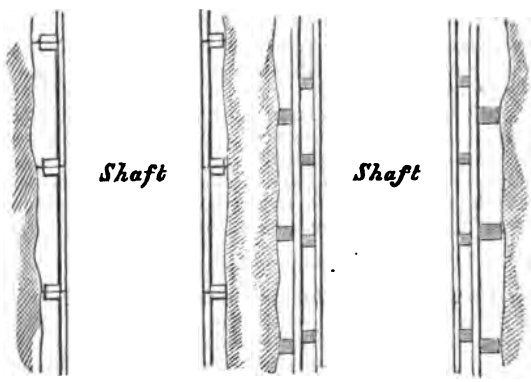
The water at St. Lawrence colliery, near Newcastle, was analyzed as follows:—

Sulphate of lime	44·88
Chloride of calcium	854·08
Chloride of magnesia.....	193·92
Sulphate of iron	7·28
Common salt	2,938·24
	4,038·40

It is worthy of notice, that amidst the multiplicity of explorations that have been executed in this district, no salt rock has ever been met with, although it is indisputable that these waters derive their saltness from some formation other than that of the sea, being of their greater intensity.

The waters met with in the sinking of the deep collieries are shut up by an ingenious process peculiar to this part of the country, and without which the coal-mines could not have been worked, owing to the depth of the shaft and the enormous engine power which would have been required. This process consists of *tubbing* (so called from its similarity to the application of a tub or cask) or the shutting back of the water by means of a wood or cast-iron tub being formed inside the shaft, which has the effect of damming back the waters into their original cavities, and so to relieve the sinking; such process being applied to each successive feeder of water as the sinking progresses. In former days these tubs were constructed of wood, they are now universally constructed of cast-iron segments.

SECTION SHOWING TUBBING.



The shaft on the right of the section describes the mode of plank tubbing, with spiking-curbs and vertical planks spiked thereto; the inside curbs are also depicted, as well as the cleading-deals. The shaft on the left is the mode adopted of cast-iron tubbing with curbs and cast-iron segments.

Explosions and other Accidents.

The mines of this district abound with inflammable gas, in consequence of which they have often been the scene of dreadful

loss of life by explosion, as many as 100 persons having been carried off at one fell swoop.

As these collieries are explored to greater depths and made to produce such vast quantities of coal from each shaft, the excessive number of persons necessary to such production renders these explosions more appalling than in those districts where only a limited number are employed, which circumstance has led to the very common remark, that the ventilation in these parts is not more advanced in science or practice than in other mining-fields; but this is a mistake; in no part of the kingdom (generally speaking) is the science of coal-mining understood so well as here, and that for the best of reasons, viz., the extent and variety of practice under the most difficult and dangerous circumstances, of depth and of extensive workings underground, and the educated condition of the managers of collieries; at the same time, it is not to be wondered at that there should be many exceptions.

And as to the numerous accidents by the breaking of ropes and chains, &c. in the passing up and down the shafts, which abound so much in many parts, they are comparatively of slight import here, in consequence of the excellent manner in which the apparatus and the various arrangements are carried out, so that in case of Parliament being ever induced to legislate in the management of mines, less trouble and fewer changes would be found necessary here than in any part of the kingdom that I have witnessed.

The great basis of good ventilation is the rarefying furnace, which, despite of many fancied improvements and inventions, such as air-pumps, fan-machines, &c., still stands unrivalled for simplicity and steady effect; and it is to the want of this auxiliary upon a sufficiently good principle, that much loss of life may be attributed in the shape of bad ventilation.

Parliamentary Interference.

Upon the subject of parliamentary interference with the management of mines, with the view of preventing the loss of life, it has now been so repeatedly canvassed, both in and out of Parliament, that it would seem superfluous to advance anything in the shape of argument, since the Government Commissioners, during repeated examinations of collieries after explosion, have come to the conclusion that a well-arranged system of legislation would undoubtedly be the means of advancing the science of mining, and of enacting measures tending to the safety of the people; to these opinions the present ministry have declared themselves converts, and therefore the mining public look anxiously forward to the introduction of some salutary legislation, without which it is vain to expect any material change.

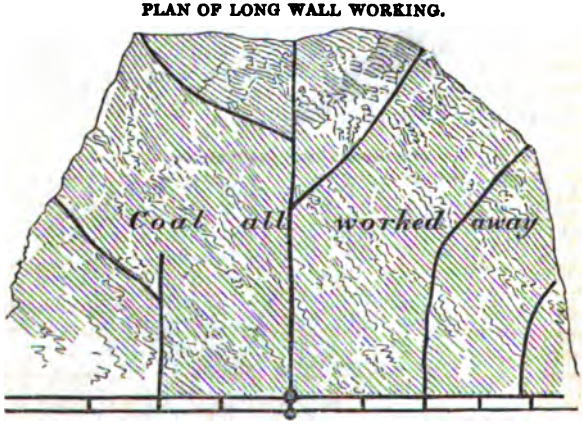
Unless tending towards legislation, to what purpose are government commissions and coroners' inquests? the prevailing error of

which consists rather in discovering the immediate cause than the state of the system. Nothing is more common than to see the whole inquiry directed to the person or persons who have acted incautiously with a lamp or a candle in a mine which is acknowledged to be in a dangerous state, whereas the object ought rather to be directed towards the system of management which has induced the mine to be found in such a state; and here is the point to which parliamentary legislation can be directed, but which no other power or ingenuity can reach.

Principles of Working.

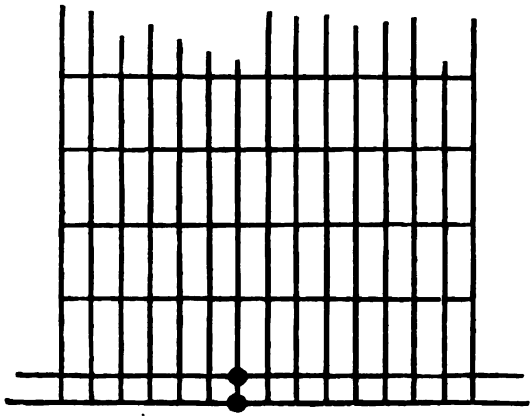
The mode of mining in this district may be said to be exclusively by *stall* and *pillar*, which pillars are also eventually removed. And it may surprise some of my readers who are wedded to *long wall* when I assert, that notwithstanding the great variety of seams, there is not a single colliery in this coal-field carried on by *long wall*. The reasons, generally speaking, are many,—the difficulty of raising sufficient quantity, the impracticability of preserving extensive roads, the ill-conduction of ventilation, the breakage of the coal, and the necessary leaving of a great proportion in the mine. It is maintained, and with much claim to correctness, that the former method is more economical and comprehensive, and that the latter method is only applicable where the workings are free from inflammable air, and are only intended to be driven to immaterial distances.

PLAN OF LONG WALL WORKING.



The two pits marked in the sketch describe the down-cast and up-cast pits, the black lines showing the tram-roads, or drifts, through the goaf, or gob.

SKETCH OF STALL AND PILLAR.



The down-cast and up-cast pits are here shown, with the coal worked away and the pillars left.

Modern Improvements.

Amidst a succession of minor improvements which are continually progressing, the tub-and-cage system, which was introduced about the year 1834, and which has now become universal, is not only the greatest improvement of modern times, but is peculiar in *being applicable to every colliery and mine*, of whatever fashion its nature and arrangements may be. The tubs are constructed of wood or iron, of suitable size to the situation, and are furnished with wheels to traverse the tram-ways; the shaft is fitted up with wooden slides, which answer the purpose of guiding a cage wherein is placed the tub; by this means all collision in the shaft is saved, and the work, as well as the changing of the people, can be executed with the greatest despatch under scarcely any risk. It is by this means that Cramlington pit, with a cage for two tubs, containing 9 cwt. of coals each, can raise from the depth of 90 fathoms 750 or 800 tons per day regularly.

Other modern improvements consist of inclined planes, either self-acting or worked by steam-engines; edge-rails, instead of the ordinary tram-way; wire ropes; drops for conveying the coal-waggons to the deck of the vessel to avoid breakage; the safety-lamp; the splitting of the main current of air into minor currents, with improved rarefying furnaces, &c.

Progressive increase of Outport in this Coal-field.

In my historical view of this coal-trade I have endeavoured to trace its progress from the very earliest period, viz. in 1200, when

on some of the lettings of that day the tenants were restricted to certain quantities, lest the subject should become exhausted. We have therefore now the most remarkable facts upon record as to the rapid and uninterrupted manner in which it has increased, and it is a strange circumstance to notice, that the powers of raising always preceded the demand, even at periods when the only means of production were by horse-power, so that there has from the earliest recorded times existed a stern necessity for regulating the supply by artificial means under a general compact of coal-owners.

The state of this coal-trade, and of its management by means of regulation, has frequently been made the subject of parliamentary inquiry, during which much interesting statistical information has been amassed.

During the inquiry of 1829 it was considered an important object to ascertain the probable duration of this coal-field, which task was undertaken by Mr. Hugh Taylor, the colliery agent of his Grace the Duke of Northumberland, assisted by Mr. Buddle and other eminent viewers, and the following result was submitted to Parliament :—

Progress of the trade for 28 years in the following extracts of vends coastwise and to foreign ports, viz.—

	Coastwise. Tons.	Foreign. Tons.	Total Tons.
1800	2,381,986	138,089	2,520,075
1805	2,426,616	147,146	2,573,762
1810	2,783,404	50,922	2,884,326
1815	2,717,509	159,174	2,876,683
1820	3,244,885	158,340	3,403,225
1825	3,309,386	178,544	3,487,930
1828	3,271,849	218,000	3,489,849

Extent of Coal-field.

From South Shields southward to Castle Eden, 21 miles; thence west to West Auckland, 31 miles; north-easterly to Eltringham, 33 miles; and thence to South Shields, 22 miles; being an area of.. Sq. Miles	594
From Shields northward 27 miles, with an average breadth of 9 miles	243
	837
Already excavated—Tyne, 39 miles; Wear, 40 miles; Northumberland, 26.....	105
Remaining ..	732

	Tons.
And accounting 12 feet workable thickness of coal = 12,390,000 tons per square mile × 732 = ...	9,069,480,000
Deduct one-third for waste and loss in small coals.....	3,023,160,000
Large Coals ..	6,046,320,000

And taking the annual vend at 3,500,000 tons, it will give a

duration of 1,727 years, besides the south-eastern district, yet unexplored.

Now, in this estimate, Mr. Taylor seems to omit the very large quantity of coals consumed in the district, or rather he assumes that it will be supplied by the small coal already forming the reduction of one-third; but since the period of 1829 we have seen an immense trade spring up in the consumption of coal for iron-works, foreign steam-engines, and coke, which will now form an immense addition to the contemplated vend of 1829.

The progressive state of the vend from 1829 is represented as follows:—

	Coastwise. Tons.	Foreign. Tons.	Total Tons.
1830	3,289,241	341,062	3,630,303
1835	3,290,511	494,485	3,784,996
1840	4,391,085	1,196,299	5,587,384
1842	4,548,823	1,425,125	5,973,948
1844	4,241,738	1,059,752	5,301,490
1845	5,523,178	1,784,985	7,308,163

Mr. Thomas John Taylor, the nephew of the above-named gentleman, writing upon the subject of the future prospects of this coal-trade in 1846, and who had the advantage of his uncle's still greater experience, calculated, by returns actually made in 1844-5, that this trade was capable of raising 57,713 tons of coals daily, or 15,005,000 tons yearly; and deducting one-third for small coal, left 10,003,000 tons of round coal: that the powers of raising round coal were nearly in proportion to the quantum of vend, viz., the power of raising in 1835 was 5,415,948 tons, and in 1845, 10,003,000 tons.

The progressive increase of collieries he gives as follows:—

In 1799 the number of collieries was	41
1817	45
1828	59
1834	64
1840	101
1845	129

From the quotations already made, Mr. Taylor concludes that the increase of the home vend since the year 1800 is	212 per cent.
And of the foreign	1,254 per cent.
And in the aggregate	270 per cent.

	Tons.
The average importation of coals from this district into London for the average of the years 1841-2-3 was	2,589,137
Whereas, in 1845 it was	3,207,341

Mr. Taylor observes, that according to the increase of home trade during the last ten years, and applying the principle to the ensuing ten years, the coastwise vend in 1855 will be 7,700,000 tons, and the aggregate vend for 1855 as thus estimated will be 11,000,000, which will, according to his calculation, require a considerable increase of power.

According to the statement of the *Gateshead Observer*, the vends since 1845 are as follow :—

COASTWISE.

	1846.		1847.
Newcastle	2,302,606		2,618,941
Sunderland	1,582,218		1,871,171
Stockton	662,279		727,812
Hartlepool	601,481		703,113
Total .... Tons	5,148,584		5,921,037

FOREIGN.

	1846.		1847.
Newcastle	1,064,327		1,009,641
Sunderland	478,505		476,446
Stockton	148,110		134,073
Hartlepool	186,437		186,478
Total .... Tons	1,877,379		1,806,638
Grand Total ..	7,025,963		7,727,675

Probable Duration of the Coal-field.

Having therefore brought down the progressive increase of coals exported from this coal-field to the end of 1847, it cannot but be interesting to examine into the probability of its duration upon the principle of a gradual increase, such as may be reasonably calculated upon as being warranted by past experience.

With respect to the correctness of the admeasurement of the coal-field, and the computation of the gross quantity of tons contained therein by Mr. Hugh Taylor and others, I do not mean to call it in question, but I will endeavour to show that ulterior facts enable us to exhibit how very wide they were of the mark as to the duration of the coal-field. I will in this statement deal with their gross quantities, as also the gross workings which bear upon the exhaustion, whether the coal so worked is consumed in the home manufactures or exported to the coast or to foreign parts.

First, then, I assume as correct their gross quantity of unworked coal at ..... Tons		9,069,480,000
Deduct actual vend from the year 1829 to the end of 1848 ..... Tons	102,701,830	
Add proportion consumed and wasted in the district, one-fourth	25,675,489	
	128,377,319	say 128,000,000
Gross quantity remaining end of 1848		8,941,480,000

I have then taken the *gross* working of 124 collieries, which I estimate to amount to and begin at 9,000,000 tons annually; and assuming that the rates of increase year by year during the next 100 years to be 5 per cent., the exhaustion will progress as follows, viz. :—

At the end of the 1st century	Tons	1,183,500,000
2nd century		1,242,675,000
3rd century		1,305,400,500
4th century		1,370,624,500
5th century		1,439,136,000
6th century		1,511,066,500
	Tons	8,052,402,500 .. 8,941,480,000

Showing an exhaustion in little more than six centuries.

The above statement is made upon the assumed future gross workings and the gross contents of the coal-field in 1829, according to Mr. Taylor; but I will endeavour to correct such statement by one upon the net quantity stated by Mr. Taylor, commencing with the actual vend in 1848, viz. 7,800,000 tons, and diminishing Mr. Taylor's quantity by what has been vended since that period, viz. :—

Vendable coals according to Mr. Taylor in 1829.....	Tons	6,046,320,000
Deduct aggregate vend since		102,701,000
Present Net Quantity.....	Tons	5,943,619,000

Commencing with		Amount.
1st century..... 7,800,000	Tons	1,025,700,000
2nd century 8,190,000		1,076,985,000
3rd century..... 8,590,000		1,129,585,000
4th century..... 9,019,000		1,185,998,500
5th century..... 9,473,000		1,245,699,500
Total	Tons	5,663,968,000

The gross quantity of vendable coals, according to Mr. H. Taylor, in 1829 was		6,046,320,000
Deduct vended since then		102,701,000
		5,943,619,000

Showing an exhaustion in five centuries, and a little more.

Note.—It must be observed, that of the third deducted by Mr. Taylor, a considerable portion will be included in the vend, thereby diminishing the duration beyond what it ought to be.

Unworked Coal.

The centre part of the coal-field of the county of Durham is more or less explored, but large areas of certain seams remain in the lower country, whilst in the western and most distant parts extensive tracts remain yet unmeddled with; of this description is the country to the westward of Durham, Chester-

le-Street, Tanfield, and Whickham; and in the county of Northumberland a very large area of steam coal, in several seams, extending from the river Blyth to the Coquet, awaits the increasing demand for that species of coal, which is already intersected by the Newcastle and Berwick railway, and is partially opened out by the harbour of Warkworth; and it is far from improbable that the magnitude of the supply from this district may in course of time bring into existence another coal-shipping harbour between that place and the Blyth.

The shipping ports at present for this extensive coal-field are, in the county of Durham,—the Tyne, Sunderland, Seaham, Hartlepool, and Stockton; for the Northumberland portion of the field, the Tyne, Hartley, Blyth, and the harbour of Warkworth.

Present State of the Trade.

The regulation of sales, which had continued for ten years, broke up in the beginning of the year 1845, since which period all has been reckless competition. The more expensive collieries have gone upon the principle of accomplishing large quantities of vend, in consequence of which the markets have become so depressed in price that the shipowners no longer buy, but let their vessels out to be freighted by the coal-owners, who thus become the merchants, consigning the cargoes to factors in London and elsewhere, and are thus necessarily made to stand by results the most unsatisfactory, great quantities of coals being sold at prices far below the remunerative point, and thus involving many of the owners in a losing trade. As a matter of course, many of the collieries are changing hands, many of them again are under heavy liabilities to the banks; therefore, generally speaking, the capital engaged in this trade, amounting to little less than *ten millions sterling*, may be said to be exhausting all this valuable mine at little or no return to the proprietors.

In consequence of the surcharged state of the markets, the freights to the shipowners are also necessarily very low; indeed, to such a degree of depression are these two branches of the trade reduced, that I estimate their deficiency below fairly remunerative prices, or not less than *a million and a half sterling* per annum.

Many attempts have been made of inducing the trade again to return to regulation; but the collieries are now so numerous, and the efforts of the last four years, together with the great increase in the production of coke and steam coal, seem to have disjointed former accepted understandings and thrown far and wide the materials of reunion.

When the open competition first took place, it was confidently augured that many inferior collieries would be driven out of the trade; but experience proves that although many have changed

hands, yet the total number does not sensibly decline; on the contrary, every successive bargain is made under so much more advantageous terms than the founders of the collieries enjoyed, that there now seems little grounds for hoping that the trade will be materially relieved by any such process for many years to come, and that nothing remains but to struggle on in the patient hope that in the course of time the increasing demand will so far overtake the supply as to restore the trade to a tolerably remunerative state, or that some amended principle of regulation may again induce its re-enaction.

Conclusion.

Having in the foregoing pages explained the condition of this coal-field, with a computation of its probable duration, it brings to our reflection the important consideration, in a national point of view, viz., that if the condition of other coal-fields were scrutinized in a similar manner, how much to be regretted is the error committed by the legislature of this country in overlooking the wasteful and improvident manner in which many of them are conducted; and the incalculable national loss that will ere long attend such proceedings if unchecked; such as the leaving below ground the small coal, or of screening it out to be burnt at the top of the pit; the large proportions of the mine which are sacrificed to improvident working, &c. In short, the husbanding of our coal-fields ought to be made the subject of legislation, without which it is impossible to check or control the otherwise continual sacrifice of life and property; and in the handling of this subject, how dark and mysterious are the paths which the investigator has to tread in the absence of such documentary evidence as the governments of the continent provide under their legislative enactments; he has to calculate from uncertain data what might be reduced to matters of fact; and how important would it be to the legislature to be possessed of authentic documents showing the extent and consumption of the mineral resources of the kingdom, together with its population and wealth, whereupon measures might be devised for the education and better improvement of the vast numbers of people who are supported thereby, whilst the national wealth itself would be providentially husbanded for the benefit of generations to come.

ON THE CUSTOM OF TIN BOUNDS.

BY EDWARD SMIRKE, ESQ.

THE earliest recorded notice of any custom in Cornwall or Devon to work for tin on the land of another is to be found in the charters granted to the tinners in the reigns of John and of Edward I., by which the right is conferred, or confirmed to them, "fodere stannum in moris et feodis episcoporum, abbatum, &c., sicut solebant et consueverunt, et in terris moris et vastis nostris et aliorum quorumcunque in comitatu, et divertere aquas ad operationem eorum, &c., sicut de antiquâ consuetudine consueverunt." These charters, and the principal franchises contained in them, are evidently designed for the immediate benefit of those who are there described as "operantes in stannariis," and to them only "dum operantur in eisdem." (See the charters in 4 *Inst.* 233, &c., and Appendix to *Vice* v. *Thomas*, pp. 8, 14.) Nor are there wanting other proofs that the interest or property in tinworks could be claimed under the custom by those only who made it available by working, and that they became vacant or were forfeited by discontinuance.

In a register of the Black Prince, preserved among the public records, there is a writ, 25 *Ed.* 3, reciting that tinners, claiming any interest in tinworks, and refusing to work or contribute to the working, forfeit their shares by the ancient usages ("solonc les aunciens usages"); and the proper officer of the duchy is commanded to enforce compliance with the custom by seizure of the forfeited shares. (See *Vice* v. *Thomas*, Appendix, pp. 24, 25.)

In a Stannary court-roll, 4 *Ric.* 2, there is an entry of a plea of trespass, vi et armis, for breaking and entering a tinwork of the plaintiff and ejecting him from it; to which the defendants plead "quod dictum opus stann' fuit vacans die quo supponitur, &c., et per unum quart' anni ante, et petunt inde judicium. Et querens dicit quod non fuit vacans die, &c., et hoc," &c. (Appendix, ibid. p. 64.)

In another court-roll of 21 *Hen.* 6 (*Chagford Stannary*), extant among the records of the Augmentation Office, *Smith* and *Horn* complain of a trespass by disseising them of two parts of a tinwork: the defendant pleads that at the time of disseisin the work was "opus alay," and so he entered according to the Stannary custom. Verification: Denial. Issue thereon, and award of venire. The term *alay* is well known to be applied to a neglected or deserted tinwork. (*Pearce's Laws, &c. of the Stannaries*, pp. 194, 201, 226, &c.)

So little did the custom contemplate the possession of tin bounds by any except working tinners, that at a Devonshire Stannary Parliament, held 10 *Hen.* 7, and ratified by Prince Arthur, it was provided that "no persone, neyther persones, having possession of landes and tenements above the yerely value of £10, nor noone other to theyr use, be owners of eny tynwork or parcell of eny tynworke," with the exception of persons claiming by inheritance or possessed of tinworks on their own freeholds. The original record is preserved in the Treasury of the Exchequer.

As late as the end of the 16th century, the obligation of working was not forgotten in Cornwall; for Carew says: "These bounds he" (the bounder) "is bound to renew once everie yeere, *as also in most places to bestow some time in working the myne*, otherwise he loseth this priviledge." (*Survey of Cornwall*, f. 13 *b*, ed. 1769.)

These authorities, which a more extended search would doubtless multiply, seem to confirm the conjecture of the Court (antè, p. 36), "that the unqualified right now claimed is but an abuse of the original limits of the custom."

But the custom of bounding, even with the reasonable qualification of working suggested in the above judgment, must be admitted to be open to very grave objections.

No parol or documentary evidence has ever been adduced that prescribes any limit to the area capable of being included in a pair of tin bounds. The want of some clear rule on this head strongly distinguishes the custom of bounding from any other known mining custom, English or foreign. According to the learned reporter of *Rowe* v. *Brenton* (3 *Man. & Ry.* 497, note *a*), it must be of "reasonable extent;" but the test of reasonableness is not pointed out. Carew, an author of some authority on this subject, who wrote in the reign of Elizabeth, says that, when a mine is found, "the first discoverer aymeth how farre it is likely to extend, and then at the foure corners of his limited proportion diggeth up three turfes," &c. (*Survey*, f. 13 *b*.) If this is the mode of fixing the limit of the bounds, it is one that must be founded on mere conjecture until the lode is opened, and its direction and dip ascertained, which cannot be done until the bounds have been made good by proclamation and possession. In other words, the limits of the bounded space can only be determined by a process which supposes them to be already fixed.

Again: if a large area is included, what extent of working within it will satisfy the custom, so as to protect the bounder in his enjoyment of the whole? Will inconsiderable workings in one part secure the exclusive right to all? The question is of some practical importance; for "a pair" (or party) of working tinners will make but slow progress in bringing to grass the mineral substrata of a large surface; and there is nothing in the

custom to show that the size of the bounds is to be proportioned to the capacity or capital of the bounder. In practice, tin bounds are said to be usually of small extent; yet one of the witnesses in the case above reported had himself assisted in cutting a pair which extended "a quarter of a mile each way," and must therefore have contained about 160 acres. In Devonshire, where the same custom has prevailed, the whole of Dartmoor, consisting probably of 50,000 acres at least, was, in the year 1786, included in a single pair of bounds by a person who intended by this ceremony to secure to his employer all the tin within that district.

Further, the right of the bounder is of no value without the use of running water; and this additional easement has therefore been constantly claimed as part of the custom. (*Pearce*, p. xiii., 190, &c.) It is recognised in the charters of John and Edward I., above cited (p. 41), and the roll of the Stannary Parliaments, and is often noticed in the entries of the "Opera Stannaria," or tin bounds, in the Stannary court-rolls. Yet it is evident that the enjoyment of this easement involves a claim of right both to divert streams of water flowing above the bounded district, and to discharge the water, with its acquired impurities, over all the lands below it. That such a claim is likely to experience little favour from the Courts may be conjectured from the case of *Bastard* v. *Smith* (2 *Moo. & Rob.* 129).

The custom asserts a right, not only to take tin, but "to search for" it. (3 *Man. & Ry.* 497, 498, note *a*.) Whether the search is to be justified only by the successful result of it, or the claimant is to dig at will for an unlimited time over the bounded area on the mere chance of success, is a matter on which the custom and its interpreters are silent. If the larger power exists (as it is usually assumed to do), it is one which may seriously affect titles; for all Cornwall is admitted to be stannary, and all Devon is *claimed* to be so. (See the Minute of the Privy Council 7 *Car.* 1; Appendix to *Vice* v. *Thomas*, pp. 36, 37.) The custom is indeed confined to *wastrel;* but enclosed land "that hath been anciently bounded and assured for wastrel," is included in this description (*Convoc.* 12 *C.* 1, art. 3, antè, p. 4, note *b*); and *all* Duchy land belonging to the seventeen assessionable manors, whether waste or enclosed, is asserted by the tinners of the Convocation, 26 *G.* 2, to be subject to the custom. (See art. 8, antè, p. 6, note *b*.) Accordingly, it was stated by one of the witnesses in the present case, that the parish church and cemetery of Helston are now actually situate within tin bounds; and by another witness, that he "believed all the lands of the Duchy in Cornwall were bounded or boundable."

The custom nowhere provides for the occurrence of veins of mixed metals, but is evidently adapted only to the superficial tinworks, formerly very productive, called stream-works.

Mines are now worked indiscriminately for tin, copper, and such other metals as may be, and often are, combined in the same lode. The separation of them is a process of some nicety; and one mineral is sometimes sacrificed for the sake of the other. The adventurer avoids any question by taking a lease or license from all parties interested in the different minerals; but the bounder, who relies upon the custom alone, must either claim, under that custom, a right to deal with, and, if need be, destroy the property of another, or must work at the peril of becoming an involuntary wrongdoer by detaching from the vein a metal which does not belong to him, and which was not the object of his search.

A still more serious difficulty will occur. There is a great extent of land in Cornwall which is, or heretofore was, of customary tenure. The tenement of Galidna, mentioned in the case now reported, belongs to this class. In such lands the mines belong to the lord of the manor, and not to the customary tenant (*Rowe* v. *Brenton*, 3 *Man. & Ry.* 133; *S. C.* 8 *B. & C.* 737); and the toll tin is paid by the bounder to the lord, and not to the owner of the surface, who alone is injured by the workings, but to whom the custom awards no share or compensation at all. Hence the consideration mainly relied upon in support of the reasonableness of the custom fails in a large class of tenements, constituting probably more than one-half of all the land subject to its operation. It is remarkable that in Devonshire, where the custom of tin bounding has also prevailed for some centuries, the title of the landowner, whether freeholder or customary tenant, to toll or to any other compensation whatever, has never been recognised. That the custom, as there claimed, is untenable in law, can hardly be doubted; but the small extent of tin workings in that county, and the consequent inconsiderable value of tin bounds, make the validity of the custom a question of little importance. In Cornwall the subject is one of greater interest, both to the bound-owner, whose title is shaken by the above decision, and to the landowner, whose estate, though relieved from the existing servitude of dormant bounds, can no longer be protected from the intrusion of a *bonâ fide* adventurer by the convenient form of an annual renewal of bounds for his own use.

SOCIETIES FOR THE IMPROVEMENT OF THE WORKING MINER AND COLLIER.

BY THE EDITOR.

It is much to be lamented that so few opportunities are afforded in mining districts for the cultivation of the mind, and promotion of social and moral improvement, by the general body of miners and colliers. The absence of any school of mines, or other establishment where instruction can be obtained in connection with mineral pursuits, or even the ordinary education which should be the aim and object of every well-constituted mind, has been the frequent regret of those who, while they possess the means, in a pecuniary point of view, it is to be regretted too oft neglect the adoption of such course as would effectually promote and secure an object so desirable.

It is now some years since that Sir Charles Lemon, Bart., M.P., in a most laudable and praiseworthy manner, endeavoured to establish a school of mines in the county of Cornwall, having expressed his readiness to contribute a sum of no less than 10,000*l.* with the view of effecting such object. The result, however, was the failure of the project, arising from the want of assistance on the part of those who are indebted to the working miner for the luxuries they enjoy, and their position in society, not to advert to the absence of any energetic exertion or aid on the part of the mining agent, the engineer, the merchant, the adventurer, and the lord. It is, we contend, a claim upon those who derive benefit from the labours of the working miner, that such institutions should be established, the absence of which may be considered as reflecting discredit on the country, as it is equally derogatory to the character to which we aspire as a nation. When we reflect that the governments of France, Germany, Russia, and other countries, support their schools of mines, it cannot be considered otherwise than as a national stigma that we possess no institution of the kind. True it is, that the Geological Society, with other scientific bodies, render through the medium of their members much useful and valuable information—our colleges can boast of having professors of geology, mineralogy, and metallurgy; but we would ask, are these accessible to the working miner and collier? The answer must be in the negative. Nor, we may observe, are there any facilities afforded for the acquirement of knowledge, or even the simple rudiments of education, except in those establishments the magnitude of which warrants the institution of schools of instruction. These in the end, there can be no hesitation in stating, from evidence before us, are found to afford an ample return for the

capital employed, by fostering an attachment of men to their masters, and by the moral and intellectual precepts afforded, thus rendering them wiser and better, and consequently more useful servants.

Among the few instances of the kind, we may take as an illustration on which our remarks are founded, that of the WEARDALE MINERS' IMPROVEMENT SOCIETY, instituted by T. Sopwith, Esq., the principal agent of Mr. Beaumont's mines in Northumberland and Durham. It will be our province to offer some few observations on this approximation to a mining school; in doing which we shall avail ourselves of the address of its founder at the commemoration of the first anniversary, and also give a digest of the rules observed, which we should hope, from the success attendant on this praiseworthy effort, will be generally adopted, and, as we believe, universally approved.

It is little more than twelve months since this Society was numbered as one of the intellectual organs for the promotion of knowledge; and the steady perseverance which has been manifested—the strict appliance of its members, numbering upwards of eighty, under the age of twenty-five years, while, since its formation, not one-third of those who were its first members have seceded, the remainder having readily signed and observed the obligations imposed upon them, and upwards of seventy members being present at the anniversary to which we refer—afford conclusive evidence of the appreciation in which the infant society is held.

It may be observed that the instruction is confined in its nature to such as may be considered best suited to the position and capacity of the members as working men; while their own selection of books, we learn, has been uniformly judicious. Occasional lectures are given, and invariably listened to with marked attention by those assembled.

In the address before us, which was issued in a printed form, it is observed that the main object in placing it in the hands of the members was not only to afford them information as to the result of the past year's labours, but with the hope that by an extended circulation it would stimulate other young men residing in the district to become associated with the Society, contemplating those great advantages which must naturally arise to the district as well as to themselves by that advancement and improvement which continued perseverance in the observance of the rules would undoubtedly afford.

Mr. Sopwith, in his very lucid and *practical* address, for such it is, as addressed to practical men, observes that amidst the various business occupations which engross his time, he can never forget how much his own duty and the interests of the miners under his control are concerned in the accomplishment of any well-devised means of improvement suited to the position

the latter occupy as miners, and suited also to the abundant opportunities of leisure inseparable from mining occupations, which leisure, if not well employed, is but too apt to become a means whereby much evil originates—for idleness or ill-employed time, he truly states, is the fruitful cause of all mischief.

The object of the Society is twofold—and here we may for a while follow the words of the report—"the first and governing principle or basis is that of abstinence from intoxicating drinks, by young men up to thirty years of age; and the second, the formation of classes, in numbers varying, as the case may be, from three or four members to nineteen; but when the number amounts to twenty, two classes are formed, it being thought desirable to have the classes to consist of ten members in each, when it can be conveniently arranged. These classes are self-governed by a convener and committee of their own choosing; they decide for themselves what entrance-money and what monthly payment (usually 4*d.* or 6*d.*) they are willing to contribute, and they dispose of these funds in the purchase of books or by making contributions to the general library fund, in which latter case they receive the full value or more, in suitable books or instruments, &c. Weekly meetings are held in the immediate locality of each class, and a general meeting takes place once a month at the Miners' Lodge at Newhouse—a spacious room, expressly built with a view to the comfort and accommodation of the miners. At these meetings, during the past year, the attendance generally has been both numerous and respectable, and the greatest order has been observed. The progress of improvement in writing, by a large number of the members, has been very great, and several drawings of geometrical figures and of strata and mineral veins have been executed in a manner which reflects the highest credit on the authors of them. I have attended these meetings as often as my engagements would permit, and the members had on three different occasions the opportunity of hearing very able addresses, by Professor Pillans, of Edinburgh, one of the most active and enlightened promoters of education; Robert Chambers, Esq., one of the conductors of the *Edinburgh Journal*, and other numerous and invaluable works, which have been so justly appreciated by the public; and Armorer Donkin, Esq., of Newcastle, an employer of a large number of workmen, and a zealous friend to the improvement of the working classes generally. The Miners' Lodge has also been placed at the disposal of such classes as could make it convenient to hold their weekly meetings in it. Such is a brief outline of the past operations of the Society.

"With the best wishes for the welfare of the working classes, it is necessary to make a large allowance for the disadvantage under which many of them labour, for want of early training in those strict principles which are essential to the performance of

any high duty; and in the great number of young men who have joined the Society, it was to be feared that some who entered with the best intentions might not be endowed with strength of mind to carry out these resolutions. The temptations to intemperance which beset the young are not only of frequent occurrence, but are unfortunately often combined with circumstances which render it difficult to observe a rigid adherence to a strict rule. The consideration of this, and of the infirmity of purpose, and tendency to error to which all are more or less liable, calls for the exercise of kind and Christian feeling, and for the forgiveness and forgetfulness of those imperfections to which all are more or less liable."

Addressing himself more immediately to those who are or have been members of the Society, Mr. Sopwith observes, "that in the midst of many advantages possessed by them, and with many qualities for which they justly merit commendation, the dangers to which they are subjected from a constant liability to be led into habits of intemperance are of no ordinary description, and are in themselves sufficient to fully justify them in the adoption of the rule of total abstinence during the earlier period of their lives. It is on such a course only," he continues, "that you can rely for safety; and though it is not contended that there is any harm in the moderate use of refreshments, yet if that moderation be found by sad experience to be a frequent introduction to excess, you will, I am sure, be convinced that it is better to abstain than to run so fearful a risk—a risk which has proved fatal to thousands. It is true that some of you have not persevered, yet the very fact of your having undertaken such an obligation induces the hope that your good resolutions may again revive; and this hope, together with the allowance that may reasonably be made in the first year of so novel an experiment, has induced me not to make any alteration in the list of names until another year has shown whether the majority show an example of steady perseverance. The difficulties which attend the formation of any new Society, and especially one which imposes so great a restriction, are undoubtedly great, but the benefits to be gained by success are still greater, and are such as to afford much encouragement to all concerned. If this Institution finally prevails, it will be a model to the young men of the working classes generally—it will be a step in advance of the school, and may be the means of imparting much useful learning to those who would otherwise proceed on the journey of life with minds unstored with knowledge, and unfitted for the discipline which is required in the active duties of mature age. If weakness and indecision should lead you to abandon your good resolutions, it will only add to the many and distressing examples of the indifference which the working classes themselves show towards the efforts made to ameliorate their condition."

Such is the nature of the address from which we have made the preceding extracts; and feel assured that there is not a mine proprietor, agent, or adventurer, but who will laud, and, as we trust, follow the example thus set.

In conclusion, we will briefly advert to the "obligations" entered into by the members. In the first instance, the evil effects arising from frequenting alehouses are acknowledged, and the several members agree that until they shall have attained the age of thirty years they will not partake of any intoxicating liquors, such obligation being entered into as an example to others. It is provided that the meetings of the several classes be held at such places as may be approved by the Committee, each member paying a sum, to be determined upon, per month, and to be appropriated, with the several donations, subscriptions, and fines, to the purchase of books, writing or drawing materials, and other useful objects. At the annual meeting three members are chosen to form a local Committee, the several members of the "class" meeting one or two evenings in each week to *read and write*, as also to pursue any means of mutual instruction and improvement which may be recommended by the Committee. Any member may introduce a friend to the several weekly meetings of the "class," having previously obtained permission.

RECORDS OF ANCIENT MINING.

BY J. Y. WATSON, ESQ., F.G.S.

It is supposed (for we have no correct data) that copper was first found in Britain during its occupation by the Romans, brass-foundries having been erected by them in various parts of Britain,* where their weapons of war and other articles were made. Ignorant of regular mining, and without the means of exploring far beneath the surface, the Pary's mine, in Anglesea, is generally believed to be that from which the Romans derived their ore; and this supposition is strengthened by the fact that, among the vestiges of ancient mining, one of the mountains is termed the "Roman work." The Pary's mine stands unparalleled for productiveness; and was worked out during the 17th century at a very trifling expense. The labour consisted in quarrying huge masses of ore, which rose to the surface of the ground on the summit of a hill, and for a prodigious extent exposed to the glare of day. The quantity

* Borlase Antiquities, lib. 3, cap. 13.

of copper which this single mine poured into the market for twelve years in succession, from 1773 to 1785, made such an impression as to lower the price of that metal throughout Europe; and nearly caused the ruin of all the poorer mines in England, and more particularly those of Cornwall. At last, however, the riches of Anglesea began to decline, and in the year 1791 the reduced produce of the Pary's, in conjunction with the ruin of some Cornish mines, raised the price of copper from £80 to £90, and in 1792 to £100 per ton. In 1796 the price reached £118, and in 1799, when the Pary's mountain was nearly exhausted, the price of copper rose to £128. In the height of its prosperity the annual produce of this mine was 3,000 tons of copper.

In the 13th century, Cumberland was the only part of Great Britain productive of copper of which there are any records. At Newlands, near Keswick, some rich veins of ore were worked about the year 1250, as appears from the close rolls of Henry III. Camden says of these copper works, "that they were not only sufficient for all England, but great quantities of copper were exported every year." It appears also from a charter granted to Keswick by Edward IV., about A.D. 1470, that that place was then famous for copper-works. Some of these works were again opened in Camden's time, and his commentator adds, "the works were destroyed, and the miners killed in the civil wars."

In the reigns of Henry VIII. and Edward VI. we find * that several acts of parliament were passed, prohibiting the exportation of brass, copper, latten, bell-metal, gun-metal, &c. &c., under a penalty of forfeiting double the quantity exported.† The reason given being "lest there should not be metal enough left in the kingdom fit for making of guns and other engines of war, nor for household utensils."

Ecton Hill, in Staffordshire, was another spot where copper was produced in great abundance previous to the era of copper-mining in Cornwall. Dr. Plot, who published his history in 1686, says it had been worked long before that period, as the ore appears to have been originally found very near the surface.

Edward IV., in the 8th year of his reign, granted all his copper-mines, containing gold and silver, in Cumberland, Westmoreland, and Northumberland, to Dodrick Waverswick; and Dr. Fuller, in his "Worthies of Cumberland," observes, "that, in taking the rich copper-mines from the Duke of Northumberland, at Keswick, it came to pass that this queen (Elizabeth) left more brass than she found iron ordnance in the kingdom." And in the 10th year of her reign, Plowden says, "She took from the Earl of Northumberland his rich copper-mines of Keswick, because of its holding so much silver and gold in the ore."

* Watson's Chemical Essays, vol. iv. p. 75.
† 21 Henry VIII. c. 10.

Boyle, in his "Useful Philosophy," says, "A friend of mine found, in his own land, a parcel of ore, which seemed to be copper. After fusion, it yielded very good copper; but the person to whom he committed the examination, being extraordinary skilful, found, besides the copper, a considerable quantity of silver, and in that silver a good portion of gold."

The grants made by Edward III. of the copper-mines in Northumberland, Cumberland, and Yorkshire; those of the same king, of *all the gold and silver mines* in Cumberland, Westmoreland, and Devonshire; those of Richard II., Henry IV., and Henry VI., of the same mines; a grant of Henry VI. to John Boatright, of all copper, tin, and lead, possessing *gold* and *silver*; more especially the grant of Henry VII., who, in the first year of his reign, constituted the Duke of Bedford, and others, commissioners of *all* the mines, not only of gold and silver, but of tin, lead, and copper, in England and Wales, upon paying to the king the fifteenth part of the gold and silver, and to the lord of the soil the eleventh part; and also the grant of Queen Elizabeth, who, in the 6th year of her reign, granted all ores, mixed and compound, and all other metals, minerals, or treasures to be found in earth or ground in England, and the English pale in Ireland, with license to dig and search for the same, and build houses, &c. &c., for their own use (the disturbers of the grantees or their miners to be imprisoned for six months, without bail or mainprize), with power to take up and use all necessaries for their workings, and to *fell timber*, &c. &c.; "the queen to receive, for every hundredweight of gold ore, eight ounces of gold, and of the silver the twentieth part;"—were all very prejudicial to the progress of mining, and operated directly contrary to the intention and expectations of the Crown and grantees, who had the power, not only of seizing upon people's mines and working them, but of destroying their land and estates; for though there were clauses in several of the Crown grants, obliging the lessees to repair any damage done to the estates, the grantees seldom or never paid any attention to the proprietors of the land, but tore it up, sunk shafts, and made roads at their pleasure, and left the proprietors to their remedy; so that, instead of leading to the discovery of new veins, or the increase of the number of mines and workings upon those veins already known, these grants caused a general inactivity and stagnation, and mining in these counties became neglected.

In all the old grants of Queen Elizabeth to the incorporated society of "Mines Royal," and also the society of "Mineral and Battery Works," which were confirmed by James I. to the Earl of Pembroke, Lord Cecil, and others, the counties of Cumberland, Westmoreland, Yorkshire, Lancashire, Devon, and Cornwall, and the principality of Wales, were granted, as being "the counties where gold and silver mines were most abundant."

An author of some experience in mining operations, in 1700, expresses his surprise "that more pains are not taken to search *Essex* for mines of different metals,"—and several learned people assert that the money which Cunobeline, Prince of the Trinobantes, coined at Camelodunum, in Essex, was drawn from a mine in that county. This is certainly a mistake, although some have appeared to believe it; and Agricola, in his work "De Re Metallicâ," p. 26, speaking of those parts, says, "Naturalia venarum signa observavi;" but here he did not allude to the usual metalliferous deposits, but veins of ruddle and iron pyrites, some of the latter of which, it is possible, might occasionally produce very small quantities of gold.

Henry IV., in the 22nd year of his reign, having received information of a concealed gold-mine in Essex, commanded Walter Fitzwalter to "apprehend all persons concerned in concealing the said mine, and bring them before the king and his council, to receive what shall be ordered."—*Tower Records, Rot.* 34.

About 160 years since, two gold-mines were stated to have been discovered; one at Pollux Hill, in Bedfordshire, and the other at Little Taunton, in Gloucestershire. "The Society of Mines Royal *seized them*, and granted two leases of them to some refiners, who extracted some gold; but they did not go on with the work, as the gold sometimes would not repay or requite the charge of separation, *though often it did.*"—*Essay on Metallic Works.*

Dr. Leigh, in his "History of Lancashire," page 82, says, "We have, in England, quantities of copper sufficient to supply all Europe. If the mines of copper ore were rightly managed, we should not import *any* copper." Also, page 82, "The right method of running the *copper, which is got in the north*, is by reducing the ore to a small powder, afterwards by wasting it, and then, by an addition of lixivial ashes, the ore, in a proper furnace, will run into a *fourth* part of malleable copper."

The Beacon Rake lead-vein, in Derbyshire, was wrought by the Romans with great advantage, and, several centuries after, it was partly reopened by an ancestor of the Duke of Rutland, who made very large profits from the workings, but was compelled to abandon them in consequence of the then prevailing ignorance of the geology or habitudes of the strata about the mine.

Cwsumblock, in Cardiganshire, is stated to have been wrought by the Romans and Saxons, and afterwards, with great profit, by the Patentees of Royal Mines; and, after them, by "The Company of Mine Adventurers." The vein is now larger than ever, and now yields above sixty ounces of silver in a ton of lead. —*Thiers'* "*Second Discourse.*"

The Greek and Roman miners were held in high estimation,

and the ancient civil law granted them many privileges, alleging, as a reason for so doing, that the miners were very useful and valuable to the public.

Queen Elizabeth, in the tenth year of her reign, by letters patent, discharged all miners, and all other persons occupied in finding, digging, and refining metals or minerals, from paying any taxes or impositions, and relieved them from serving on juries, and made them free from arrests.

The oldest mine in Europe productive of copper, although principally worked for copper, was that of Rammelsberg, near Goslar, in Lower Saxony, the history of which has been traced as early as the tenth century. The celebrated mine at Fahlur, in Sweden, was the first to enter into competition with the Rammelsberg in the supply of copper, and which event took place in the 12th century. The copper-mines of Thuringia were opened at the commencement of the 13th century, and during the 14th, 15th, and 16th the copper produced by these mines, and others of less note in Germany and Sweden, supplied the wants of all Europe.

Previous to the 17th century, few records exist of the production of copper in Cornwall. The first sale on record of copper ores was in 1729, when 2,216 tons were sold for the year; in 1730, 2,832 tons; in 1731, 2,555 tons; in 1732 only 1,714 tons; and in 1733 the quantity increased to 3,113 tons. Of these years no records exist to show the produce or per-centage of the ore, nor even of the quantity of ore raised from 1733 to 1764. In the latter year the quantity was 16,437 tons, yielding a produce of 11¼. The quantity raised kept gradually increasing from 1764 to 1773, in which latter year 27,654 tons were raised, yielding an average produce of 11 per cent. From 1773 to 1800 no records exist. In the latter year we find the quantity was 55,981 tons, yielding 5,187 tons of copper and £550,925. 1s. in money, average produce, 9¼, standard, £133. 3s. For ten years the quantity varied from 60,000 to 78,000 tons per annum; and in 1805 I find the standard was £169. 16s., with a produce of 7¼. This is the highest I can find, and was, I suppose, before the smelters could boast a monopoly. In 1822 the annual produce had reached 100,364 tons, yielding £638,715. 9s. 6d., produce, 8¼; standard, £106. 14s. In 1830, 141,263 tons, £802,979. 9s., produce, 8½, standard, £103. 2s. In 1840, 147,266 tons, £792,758. 3s. 6d., standard, £108. 10s., produce 7½. It will be observed that although in 1840 the quantity of ore raised was much greater, yet the money realized was much less than in 1830; indeed, it appears throughout the tables to which I have referred, that the quality of the ore deteriorated almost annually, for which I can only account by the supposition, that as the mines became deeper the ores became poorer. To bring these statistics to the present time, we find that in the year ending June 30, 1848, the quantity

of copper raised in Cornwall was 155,616 tons, yielding in money £825,080. 2s. 6d., average produce, 8¼, and standard £97. 7s.

The largest amount of money realized for the produce of Cornish mines in any one year from 1729 to 1848, I find was in 1836, when 140,981 tons brought £957,752. 8s. 6d., at a standard of £115. 12s., produce, 8¼.

Having treated principally on the mines of copper, it may be briefly observed, that with regard to lead, this metal was raised by the Romans in Derbyshire, Cardiganshire, Cumberland, and other northern counties. In the reign of Edward I. 1,600 pounds of silver were raised in three years from a lead-mine in Devonshire.* Sir Hugh Myddleton cleared £2,000 a month from a lead-mine in Cardiganshire,† with the profits of which it is said he commenced the New River from Ware to London. In the time of the great rebellion these same mines yielded 80 ounces of silver to a ton of lead, and part of the king's army was paid with the silver, which was minted at Shrewsbury.‡ In 1604 nearly 3,000 ounces of Welsh silver were minted at the Tower; and in 1637 a mint for coinage of silver raised in Wales was established at Aberystwith, and here were coined halfcrowns, shillings, sixpences, &c., all stamped with the ostrich feather on both sides.§ In a "History of Metals," published by Webster, in 1671, two mines are mentioned, in the West Riding of Yorkshire, where "lead ore, abounding in silver, was gotten,"—one was at Brunghill Moor, the ore of which held about the value of 67 pounds of silver in a ton; the other was in the parish of Gisburn, and had formerly belonged to a Mr. Pudsey, who is supposed to have coined the silver he got out of his mine, there being many shillings in that county, which the common people called Pudsey shillings.

Even so lately as 1835 the county of Cornwall returned comparatively little lead, only 140 tons of ore, whilst Cumberland, Northumberland, and Durham returned 16,626 tons; Yorkshire, 4,700 tons; Derbyshire, 4,000 tons; Shropshire, 3,539 tons; Flintshire, 9,380 tons; Cardiganshire, 1,200; and Denbighshire, 177 tons. Of late years, however, the East Wheal Rose Mine, in Cornwall, has returned 6,000 tons per annum; whilst in the eastern district of the same county, and on the borders of Devonshire, seven mines, new within the last few years (Trelawney, Trehane, Mary Ann, Herod's-foot, Callington, East Tamar, and Tamar Consols), are yielding near 6,000 tons per annum, for the most part rich for silver. It will be seen by this, the great advance Cornwall has made in lead-mining, whilst other counties (excepting Cardiganshire, where mines are on the increase) have retrograded.

* Hollinshed's Chronicles, ii. 316.
† Oper. Min. Explic. p. 245.
‡ Essay on Metals by Sir J. Pettus.
§ Rym. Fœd. t. xx. 164.

Very little gold having been found in this country, it is not the intention to dwell long upon it. A specimen a few years ago was found among tin in a stream-work in Carnon Vale, Cornwall, equal in weight to upwards of ten guineas; and we have seen some fine specimens, found at South Molton, in Devonshire. At Wicklow, in Ireland, several solid pieces (one weighing 22 ounces) were found some years ago.

Silver was originally, and at a very remote period, found in Greece, Macedonia, in the Black Sea, and on the borders of the Rhine. At the present day, it is chiefly raised in Mexico, though some considerable quantities are extracted from the lead raised from British mines.

The silver-mines of Argueros were first discovered in 1825, by a muleteer, who was cutting wood on the mountain. He found by chance some rolled blocks of native silver, and on the discovery, some miners went to the place, and collected more than 10,000 piastres' value, from the rolled stones they gathered on the surface. From that time until 1840, they have produced annually about 30,000 marcs of silver, or about £120,000. These mines are worked on two lodes, which run from south-east to north-west, and dip almost vertically, with a slight inclination towards the south-west. The run of these lodes is very regular, but the breadth varies from two to three feet.

The mules employed at the amalgamating mines in Mexico are opened after death, and from two to seven pounds of silver are often taken out of their stomachs.

Tin was known in Cornwall several centuries before the birth of Christ; originally discovered on the ancient moors by the inhabitants searching for peat. Its value seems to have been unknown before the Phœnicians arrived on the coast, and made it an important article of commerce. This commerce was noticed by the prophet Ezekiel, and alluded to in Homer's Iliad, written 900 years before the Christian era:—

> "In hissing flames huge silver bars are rolled,
> And stubborn brass, and tin, and solid gold,
> A darker metal mixed, intrenched the place,
> And pales of glittering tin the inclosure grace."
> *Homer's Iliad.*

This trade in tin was carried on for many centuries between the Phœnicians and Cornish, the tin being, as it is supposed, shipped from Falmouth to Gades, a colony on the western coast of Spain, founded, according to Velleius Paterculus, at the same time as Utica,—878 years before Christ.

From the reigns of Charles I. to George I. the block tin produced in Cornwall averaged 1,500 tons yearly, the produce then increased, and in 1742, the Mines Royal Company raised £140,000, to encourage the trade, by farming it for several years at a certain price.

From the year 1750 to 1837, the annual produce never exceeded 5,000 tons, but generally averaged 2,500 to 3,500 tons. In the latter year, an application having been made to the government to abolish the duty paid to the duchy of Cornwall of 5s. on every 120 lb., the state of the mines was officially ascertained, and showed, upon 58, the loss was £80,517, and upon 10, the profit was £20,358; net loss, £60,159.

In 1787, Mr. George Unwin, a purser of an East-India ship, —as an adventure,—took some tin from the Malacca Isles to China, and made a handsome profit by the speculation. On his return to England, having learned the price of tin in Cornwall, he brought the subject before the East-India Company; and in 1789, the East-India Company purchased and sent out a small quantity from Cornwall, which fully answered their expectations; upon which they entered into arrangements with the tinners of Cornwall for an annual supply. This exportation to India speedily advanced the price in Cornwall; but the Cornish having found the benefit of such a connection, were not easily induced to relinquish it. An artificial system was, therefore, created, by which the East-India Company were still supplied, although their price was lower than that paid to the tinners in Cornwall, whilst the price in the home market was kept high enough to make up the deficiency. By this system, the quantity delivered to the East-India Company had always reference to the produce of the mines, and the demand at home—this varying from 500 to 1,500 tons per annum; and the average price of tin in Europe was, in consequence, much higher than it would otherwise have been.

The first price paid by the East-India Company was £68. 13s. 4d. per ton, delivered on board their ships in London. In 1792, it was advanced to £71, and on the renewal of their charter, about that period, they agreed to take as much as 800 tons annually, at £75, and a further quantity of 400 tons (should the Cornish wish to sell it), at £68. 13s. 4d. These prices continued until 1809, when the difference between £75 and the price of the home market was so great, that the Cornish refused to sell any more unless the price were advanced, and in 1810 none was exported to India. In 1811, the Company advanced the price to £78, and in 1812 to £80. The system, however, became more and more difficult to maintain, and in 1817 this connection with the East-India Company terminated, and only a few small parcels were afterwards exported to India.

RISE AND PROGRESS OF THE CORNISH STEAM-ENGINE.

BY JAMES SIMS, MINING ENGINEER.

I COMMENCED engineering in the year 1811, at a period when the steam-engine was in a very rude state; and, from that time to 1814, little or no improvement in the mode of constructing the steam-engine took place, but was carried on just as left by Boulton and Watt, and their active agent, Mr. Murdock. The increase of duty was, therefore, only just as follows, taking the three following years of 1812, 1813, 1814:—Average duty in 1812, 19·3 millions; 1813, 19·5 millions; 1814, 20·6 millions. In the latter part of 1814, Mr. Arthur Woolf erected one of his patent combined cylinder engines, and with great success, when compared with those of Boulton and Watt. Mr. Woolf's engine being so well known, it does not, of course, require any explanation from me. The principal feature in his mode of working was, that of using much higher pressure steam than had hitherto been used; and in order further to economise the use of it, and thereby economise the use of fuel in proportion, he worked the steam a second time in a larger cylinder—thereby carrying out the expansion principle of steam to a much greater extent than had been attempted by Boulton and Watt. In order to use the higher steam, Mr. Woolf was necessarily obliged to adopt a different form of boiler—the old waggon boiler not being strong enough to contain steam of such a pressure as was necessary for his engines. His boiler—the form of which has appeared in several publications—was of cast iron, and was a quick generator of steam; but did not answer well in practice, in consequence of the expansion and contraction of the pipes, of which it was partly constructed, frequently breaking. This fact, together with the many attempts to work the engines more expansively with the old boilers, which were not found to answer for want of sufficient strength, led to the general adoption of Trevithick's boiler, which, as regards safety, and as a good generator of steam, has been found to be the best boiler hitherto invented. The duty of Woolf's engine having risen to 52·3 million pounds, lifted 1 foot high by the consumption of one bushel of coal, and he having improved several Boulton and Watt engines, by causing them to work more expansively by using higher steam, awakened the whole of the Cornish engineers to a new era in steam power; and many a sleepless night have I had with others in repairing the many breakages of engines and boilers, caused by the boilers being too weak for the steam attempted to be used, and the

material of the engine not being strong enough for the concussion given by the sudden admission of much higher steam on the piston than was originally intended.

Amongst the many attempts to compete with Mr. Woolf's improvements was that of Trevithick's pole-engine. This was simply a pole, similar to our poles used for plunger or forcing-pumps. The inventor considered that, by working with very high-pressure steam, making a longer stroke than usually employed, and expanding the steam, together with the simplicity and consequent cheapness of the engine, he would be able to equal, if not exceed, the duty obtained by Mr. Woolf. The constant exposure of this immense pole to the atmosphere at every stroke the engine made, the very high steam necessary, thereby causing frequent injury to the boilers, and the loss of that very important appendage to the steam-engine—the condenser—and, consequently, want of vacuum; and the benefit of the pressure of the atmosphere, soon put a stop to the use of this engine. In the year 1816, my father, having considered that Trevithick's pole connected to the Boulton and Watt engine—thereby making a combined cylinder engine of it—would be nearly, if not equal, to the Woolf's engine, entered into an arrangement with that gentleman for the use of it; and, having attached a pole to an old Boulton and Watt engine, he was not disappointed in his expectations, as may be seen by a reference to the *Monthly Reports of Steam-Engines* for 1817, which shows that Sims's engine, at Wheal Chance Mine, performed 49·9 millions; and Woolf's engine, at Wheal Abraham, performed 51·0 millions. Woolf's being a complete new engine, and Sims's being an old engine, altered, I considered, the duty—inasmuch as regards the principle of the engines—much the same. Several of these engines continued in use some considerable time; but the Boulton and Watt engine, having undergone several modifications in its construction, together with great care in its manufacture, and working with a much higher degree of expansion, accomplished by having stronger engines, and also having them of longer stroke and larger dimensions than hitherto used, improved the duty so much, that, in 1825, with an 80-inch engine, erected at Polgooth Mine, near St. Austell, by Sims and Son, the duty stood as high as 54·0 millions. About this time, Capt. Grose (an engineer of eminence in this county) erected a 60-inch cylinder-engine at Wheal Hope Mine; and having found, by some experiments he had made, that the clothing system, to prevent the radiation of heat, had not been carried out so far as to obtain the greatest benefit, he at once gave his engine a complete clothing with the best non-conductors then available; the result was, that the engine very far surpassed every other engine in duty—having, in 1827, reached 62·2 millions. About this time Capt. Grose erected two new 80-inch cylinder-engines at Wheal Towan; and, by great

care in the manufacture of the engine, simplicity of construction, together with great care in the arrangement of the pump-work, he attained the enormous duty of 87 millions—doing as much work with one ton of coal, in 1828, as was accomplished with four tons in 1815. No improvement of consequence in the Cornish single-power pumping-engine has taken place since that time. Some few engines have occasionally been reported higher—caused by working with a higher degree of expansion, or by having superior fuel, and by having the proper maximum of work to do; but it may be fairly said, that Capt. Grose brought the Boulton and Watt single-power pumping-engine, as used in Cornwall, to a state of perfection, which has received no further improvement—so far as regards duty—for the last twenty years. Although the duty of the single power pumping-engine was not got to so high a state of perfection, there was room left for a very important improvement in the stamping and winding engines—the average duty of stamping-engines at that time being no more than about twenty millions; and that of the winding-engine much below. I therefore suggested the propriety of carrying out the same principle in those engines; and, in 1825, I erected a stamping-engine at the Charlestown Mines, near St. Austell, which answered my most sanguine expectations—having performed upwards of sixty millions.

Messrs. Hocking and Loam have carried out this principle in the winding-engine to a greater extent than any other party, and have realized a duty in just the same proportion. Having shown that there is a very great saving effected by the long-stroke expanding engines, I think it my duty to point out some of the inconveniences attached to this mode of using steam-power.—1. As regards the pumping-engine, the strength of engine and pumpwork must be increased in proportion to the rate of expansion; this, together with the increased length of stroke, causes considerable extra expense.—2. As the load of the engine increases by the increased depth of the mine, the engine, with boiler and pump-work, become weaker by age and wear; hence, when economy is most required, it is least attainable: and this is frequently shown in our best engines by the duty.—3. The power of the engine is less in proportion to the rate of expansion, because it must be evident that, at whatever portion of the stroke the steam is cut off, the power of the engine must be lessened in proportion.—4. The violent concussion given to the material in the engine and pump-work at every stroke the engine makes, and which is in proportion to the rate of expansion, frequently deranges the machinery, thereby causing expensive accidents, and long and expensive hinderances to the mine. These facts induced me, some few years ago, to turn my attention to some mode of carrying out the expansion of steam to equally as great extent, without so much danger to the material; and this I have

done with my improved combined engine, where, for a given load, instead of the full force of the steam acting on the upper side of one piston only, it is in the combined engine for the same load divided—first acting on a small piston for the down stroke, and the same steam again acting on a large piston for the up stroke—consequently giving the steam equal, or, in some cases, greater expansion, without any danger to the material by concussion; and I would remark that the steam, having first expanded in the small cylinder, again expands throughout the whole stroke of the large cylinder—gives as much expansion in a 6-feet stroke as can be obtained by a 12-feet stroke in the single-acting engine. I believe the manner in which this engine is constructed is well known; it has, of course, two cylinders, one fixed on the top of the other—the bottom cylinder being about four times the area of the top cylinder. For all small engines, it is not necessary to make two cylinders, but cast it in one—the bottom part being about four times the contents of the top one. This engine will then differ from the single-power pumping-engine only by having the bottom part of the cylinder larger than the top, and two pistons instead of one; but with one piston-rod, and nearly all the other things, as the single-acting engine.

In pointing out the advantages of this engine, I do not claim a higher duty, by a given quantity of coal, than can be obtained by a very long stroke, and highly expansive Boulton and Watt engine; but I do claim a duty equally high, with a very much better application of the steam, as regards the general safety of the material, and also for increasing loads, as all mining engines are subject to; but, although I do not claim a higher duty with the combined engine, when compared with the long-stroke expanding engine, it is when put in competition with the double-power Boulton and Watt rotatory engines, working in the ordinary way, as in general use in factories, flour-mills, &c., throughout the kingdom, varying in length of stroke from 3 ft. to 6 ft., and without the benefit of working expansively, and also with marine engines, where the stroke is necessarily short—consequently little benefit from expansion. The saving of fuel, when compared with these engines, is enormous, and which is shown in the following testimonial from Mr. Hawksley, an engineer of considerable eminence:—

"Nottingham, March, 6th, 1848.—I have much satisfaction in reporting to you the excellent duty performed by the combined cylinder engine, manufactured by the Messrs. Harvey and Co., under your patent, and erected by me at the Coventry Water-Works. On a recent occasion, 1 ton of coal, weighed into the boiler-house, maintained the engine in action for 15 hours, while making 12 strokes per minute, in a double-acting pump, of 16 in. diameter, working under the pressure of a column 150 ft. high. This is equal to only 4½ lbs. per horse-power per hour, instead of 10 or 12 lbs. per horse-power per hour, usually consumed by good engines of the ordinary kind. The coal used was very inferior to the Welsh, the Newcastle, or the

best Lancashire. Had we employed fuel of a superior description, the consumption would certainly not have exceeded 3½ lbs. per horse-power per hour. The engine, when up to her speed, drives the fly-wheel with perfect regularity. I have, therefore, no doubt of the applicability of your invention to manufacturing purposes. The results would be most valuable, both in regard to economy of fuel, and the consequent diminution of the nuisance of smoke; for, with the consumption of less than half the coals, there must, of course, be less than half the smoke evolved. "T. HAWKSLEY."

I have also a testimonial from Messrs. Mason, of Sudbury, in Suffolk, equally satisfactory :—

"Sudbury Mills, Suffolk, November 4, 1847.—We have much pleasure in informing you that our combined cylinder engine, on your patent principle, is giving great satisfaction. It is now working four pair of stones, and the consumption of coal per hour is under 70 lbs., of the middling quality. We are quite satisfied it is the best sort of engine in use at the present time. "F. & P. MASON."

I would now beg to say that, whether the saving named by Mr. Hawksley can be effected by the combined engine, the long-stroke expansive engine, or any other kind of engine, it is a matter of considerable importance to this great commercial country, where steam is so very extensively in use, that the matter should be investigated, and, if found correct, to be generally adopted. I have been informed that, in Manchester, and including a radius of 30 miles around that place, there are 4,000 steam-engines at work; and I believe I am quite safe in saying, that the average consumption of coal is full 12 lbs. per horse-power per hour. I will suppose them to average 20-horse power each, and that they are consuming 8 lbs. per horse-power per hour above the engines referred to in the testimonials, and that the average time of working is 12 hours a day, and six days a week, it will then be found that it will amount to the astonishing quantity of 1,069,714 tons per year, which at 5s. per ton is £267,428. I say again, that, whether it is a combined engine, or any other kind of engine, that will effect such an immense saving, the system, fully carried out, would, in a commercial view of the matter, be of vast importance to this country.

In the marine engines, as now constructed, the expansion principle cannot be made available to any great extent, in consequence of the shortness of the stroke; the consumption of fuel, therefore, is very great. The combined engine, working wholly expansively in the large cylinder, I find the economy of fuel just the same in short-stroke as in long-stroke engines—as a proof of which I have a letter from Ipswich, informing me that the two combined engines, lately erected on the town mills in that place, are not consuming so much as 3½ lbs. per horse-power per hour; the stroke of these engines is only 3 ft. 6 in. Combined engines would save 40 per cent. over the present marine engines, and might be employed with horizontal cylinders, or in any other position, which might be found most convenient.

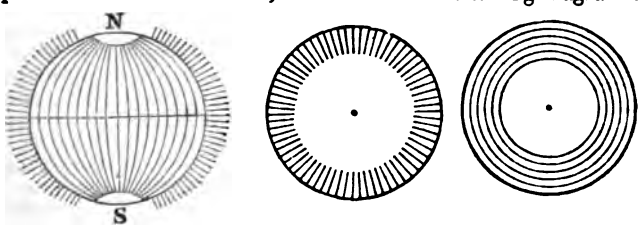
In the present state of Cornish mines—I refer to their great depth, and the very low price of their produce—I think it the duty of every engineer employed in these mines to pay every attention to economy in the construction of the steam-engine—for, however simply they may be constructed, they are still very expensive articles. There have been lately some few engines erected, which show there is a nearer approach to economy than heretofore; I refer to the inverted and direct-acting engines, which are far better, in point of economy and safety, for mining purposes, than the present lofty engines with their castles of houses—some engines having a main beam, or bob, of twenty-five tons, shaking the whole building at every stroke it makes; but there is still a more economical engine for mining and other purposes, than the inverted engine—viz. the horizontal engine. The economy of such engines must be very evident—not only in the first cost of engine and house, but also in the economy of material and fuel; and I am happy to find, that I am not the only one that has begun to adopt this plan, as I find from Mr. Wm. West, that he has three combined engines of my patent now making, each of them to be laid down horizontally. The objection to horizontal engines has been the supposed wear of the cylinder and piston by means of the weight of the piston constantly bearing on the bottom side of the cylinder; but I find that practice proves it otherwise, and that the cylinder wears just as well as if vertical. This fact is accounted for as follows—viz., the grease, or oil, with which it is lubricated invariably settles at the bottom, thereby causing the piston to be constantly moving in grease, or oil, and preventing any perceptible wear for many years. There may probably be a little more friction than in a vertical cylinder of the same size; but this is fully compensated, in the absence of a considerable amount of friction which necessarily exists in the vertical engine more than in this. I would beg to remark, that whether the engine is a single cylinder, or my combined cylinder engine, I would, for all mining purposes, fix them horizontally. These combined engines are in use for the following purposes:—For pumping, stamping, winding, grinding copper ore, weaving cloth and silk, driving machinery, and for agricultural work. The number erected is fifty-five, and there are several new ones now making.

ON THF STRUCTURE OF THE CRYSTALLINE ROCKS,

POLARITY OF CLEAVAGE AND PORES, AND THEIR INFLUENCE ON THE FORMATION OF MINERAL VEINS.

BY E. HOPKINS, C.E., F.G.S.

THERE are three distinct planes of crystallization in the compound granitic base with reference to the globe, causing the mineral mass to form a geometrical structure, viz., the polar, the radial, and the concentric. The first are in lines more or less corresponding to the meridian; the second, in connection with the first, form the cleavage planes, the medullary rays, as it were, of the sphere; and the third, the concentric exfolia, similar to the position of sedimentary beds, fluids, &c. The efflorescence of certain minerals, metals, &c., from the surface, is, like vegetation, classed with those elements which during chemical activity produce the radial structure, as shown in the following diagrams.



A minute and careful examination of the crystalline film of the earth shows very clearly this phenomenon of order, and distinctly shows the influence of the great polar force in the molecular arrangement of the semi-fluid substances which constitute the surface of the sphere.

The cleavage planes in all parts of the world are more or less vertical, as shown in the middle figure (the equatorial section), and but slightly deviating in their direction from the meridian, as marked on the first figure. In the primary rocks from the Straits of Magellan to the Caribbean coast, the cleavage planes preserve a geometrical parallelism through all the series of rocks they intersect. Again, in the Isthmus of Panama, Mexico, and North America, whatever be the contortions of the chains or the configuration of the lands, the planes of cleavage pass on without much deviation, running in parallel lines in a direction a few degrees east of magnetic north, and in planes more or less vertical. The same phenomenon has been observed in Australia, in Asia, and throughout all Europe, where the granites and primary

schists are visible. This most important fact has not yet received the attention it deserves.

It must be understood that this polar uniformity in the structure of the primary crystalline rocks is confined to the *mean* direction, because the surface is subject to many mechanical disturbances which destroy this geometrical structure on the small scale by numerous contortions; undulations by lateral expanding forces, caused by crystallization, are of common occurrence; and these disturb the uniformity in the small scale, like that produced by knots or branches in the fibres of a tree. Indeed, the schistose rocks often present the appearance of fossil trees, and continuous for miles long.

The cleavage is quite independent of the direction of ridges and secondary chains, and appears to be often the cause of the meridional strike of mountains. This active polar force in which our globe is enveloped is strongly manifested, and found diffused throughout all matter, acting both chemically and mechanically from pole to pole in the same manner, and according to the same laws, as those observed in the electro-magnetic battery. Such a power being in a constant state of activity must necessarily have a very important influence on the molecular arrangement of the elementary matter when in a semi-fluid state, in which condition the surface of the globe appears to be, particularly in depth,—that is, strongly saturated with aqueous, metallic, and saline substances. These cleavage-planes and pores are always found charged in depth with mineral salts and other exciting fluids, and are constantly enveloped with a saline ocean, and the whole compound is thus kept in a very moist state, and, continuous from pole to pole; the currents are easily conducted, and the great productions and disturbances of the mineral kingdom are perpetuated. All the earthquakes recorded during the last fifty years in South America had their main directive force propagated along the line of cleavage in a north-easterly direction, their lateral vibrations being confined to narrow bands.

In every experiment I have made for many years, the cleavage-planes are only formed *in the direction of the force*, and I have always found that the subterranean current in the semi-fluid mass causes a westerly deflection of the external polar current, as shown by the magnetic needle. When sea-water is employed, the westerly variation only amounts to about 10°; hence the polar structure of the primary rocks does not coincide with the direction of the needle, and is found on an average on the great scale, as explained above, to run N.E. of the undulating magnetic meridian. If in our experiments we wish to retain the natural and undisturbed direction of the magnetic needle, whilst within the influence of an active but weak battery, employed to produce pores or cleavage in a mass of clay, it will be necessary to place the apparatus in such a position as to make the current of the

battery to run from S.W. to N.E., that is, *parallel to the terrestrial cleavage*. This alone shows the fallacy of M. Ampère's theory of currents traversing the globe from E. to W., &c. The above fact, which I discovered ten years ago in the equatorial regions, is the most important guide in the structure of primary rocks and metalliferous deposits. On this arc of variation between the external and internal currents depends the principle of the electric telegraph, *i. e.* the westward deflection of the needle by the currents of the battery. By means of an artificial formation of a crystalline mass under the influence of a weak battery, we can, and have often, produced the laminated and elongated N. and S. veins in the direction of the currents, and also the transverse fractured veins analogous to the E. and W. lodes.

We find a general tendency of the liquid and the mass to *move towards the converging or oxidating pole*. If we divide the mass of clay obliquely from one side of the copper to the opposite side of the zinc plate, by means of a smooth impermeable substance, so as to represent a diagonal split, a dislocation is produced in the transverse lines, the triangular mass, with the greatest base towards the diverging pole, being forced forward at a greater rate than the opposite piece, and thus showing the phenomenon of 'heaves,' or dislocations.

The poles of the earth have an aqueous connection, and we can show that fluids propagate electric polarity amongst their particles; by placing a few filaments of tinfoil on the surface of water in an oblong trough, and dip into each end wires from the two extremities of an active battery, the metallic filaments will immediately acquire polarity and place themselves in a linear direction corresponding to the poles. Various solutions of metallic salts allowed to crystallize slowly between the two poles of a magnet exhibit the same phenomena amongst the individual crystals, and precisely analogous to the great phenomena observed in the crystalline and aqueous film and the enveloping magnetic atmosphere forming the surface of our globe: many experiments by Dr. Faraday have also confirmed this in a most remarkable degree. All the great movements appear to be from the diverging towards the converging points of maximum activity; or, in other words, from south to north. The great movement of the ocean in the Atlantic and Pacific is from south to north, and this action of the spherical saline fluid causes the continents as well as the smaller islands to terminate towards the south in pyramidal points, being the south-west termination of the edges of the harder variety of the primary schist resisting the wearing action of the northward current and tidal wave. Instead of the tidal waves being propagated, according to the old theory, in meridional ridges, they come constantly from the south in parallels, high and strong near the departing circle of divergence, flatten and expand at the equator, and rise again as they converge towards the north pole.

The isthmuses of Panama and Suez have both tides on their south side, where the tidal waves dam against, but they have *no tide, worthy of notice, on the north side*, nor are there tides in any inland seas. Many more of such phenomena may be brought forward to prove that the great dynamics of terrestrial physics are governed by these subtile principles of activity between the poles of the globe.

We have already stated that the primary crystalline rocks are at great depths not only moist, but frequently as soft as clay, and highly charged with mineral salts, and are not only surrounded and saturated by the sea, but also the cleavage and the great north and south splits, as well as the transverse fractures, cause still a greater degree of irrigation and electro-magnetic activity, and, consequently, the transmission of minerals from place to place as well as local accumulations.

There are scarcely any rich mines without being intersected by great north and south courses, and the more numerous, the more productive the district, and *vice versâ*. Some of these veins dam the mineral solutions, and thus form distinct subterranean reservoirs, enriching some of the meridional bands at the expense of others, and thus cause favourable points of mineral deposits.

The elongated meridional bands are subject to great tension by the action of the polar force, consequently, fractures will be produced in the less tenacious rocks; these taking place at right angles to the pores and cleavage, are favourable points of crystallization and the formation of east and west lodes. Such veins will contain what the respective meridional bands may supply from their pores or cleavage.

Bunches of ore, in veins, depend not only on the chemical character of the rocks traversed, but on the action kept up by the solution percolating through the cleavage. When a mine is opened, and the water pumped out, the aqueous continuity from wall to wall of the vein is broken, and consequently the subterranean action of that spot is stopped to the depth of the workings. A bunch of ore is never seen without showing distinctly that it was formed by the solutions in the cleavage or pores of the bordering metalliferous rock.

The isolated cavities in compact rocks, having no connection whatever with any veins, furnish us with examples of silica, sulphuretted metals, and other substances in solution, having permeated through the pores of rocks of the most solid description.

Although the principle of action in the mineral kingdom is the same in all deposits within the rocks, yet the effects differ according to the angular position of the joints, fractures, and other mechanical disturbances, and also the different compounds of minerals, and local centres of attraction.

Those who will study this subject attentively and combine it

with their practical experience, will be able to predict all the most important questions in primary rocks and mines in every part of the world. Indeed, without the knowledge of the polar structure and solvents of rocks and their composition in a rude form, mining would have been a mere guess-work: it is the degree of acquisition in this essential knowledge that distinguishes a superior mine captain from an ordinary one. Without having a full and clear insight into this important subject, the progress in geological dynamics must be slow and imperfect, as it is the key by which we obtain a clue of the cause of the great changes which have taken place on the surface of the earth, of which the entombed southerly and tropical organic remains, now in the northern hemisphere, bear unequivocal testimony.

In conclusion, if we take a glance at the great laws and effects of the polar force of our terraqueous globe, with its saline and metallic fluids with their respective oxidated dry crusts, and viewing broadly the consequences of such a combination of elements and forces in the economy of nature, we find the whole sublimely simple; they account very satisfactorily for the phenomena we observe in the comparatively minute scratches we see in the spheroidal film, without bringing forward other stupendous powers so disproportionable and so inconsistent to the ordinary laws of nature.

This question is destined to throw a most important light on the great mutations which the surface of the earth has undergone and still is undergoing, and the different climes the respective sedimentary beds have been exposed to during their development. This great prime mover has been our unerring guide across the ocean, in every spot of the globe, and the faithful guide of the miner in his subterranean explorations, and the most rapid agent of intercourse; it is the agent which is silently working within the crystalline film on which we exist; perpetually moving and modifying and rendering it suitable to our wants during all ages of transformation, and constantly providing inexhaustible stores of mineral wealth for successive generations.

ON APPLYING ATMOSPHERIC EXHAUSTION TO MINING AND ENGINEERING WORKS.

BY T. CLARK, C.E.

THE economy of this system consists in—first, to make available water or other natural power that may be near but not at present applicable with the present system;—secondly, in applying power to perform work at present done by manual labour; and thirdly, in its application at a less cost to machinery at a distance, than by any other known means.

This principle has been attempted to be introduced several times by Mr. Hague and others, but which has failed hitherto, in consequence of complexity of the apparatus employed and impossibility of preventing leakage, machinery not being then sufficiently advanced; but at the present time every difficulty is removed; air-pumps, and air-pump-valves are brought to a high degree of perfection, and pipes, made of galvanized sheet-iron with elastic joints, may be made to convey the vacuum unimpaired to any distance; thus removing the great causes of failure.

In applying this system to the raising of water from deep mines or wells, the following course should be observed:—A tube of sheet-iron (galvanized, or coated with varnish) of say two feet diameter, and one eighth of an inch thick, extending from the surface to the bottom of the shaft. The tube is riveted together in lengths of thirty feet, and then bolted by flange joints; the joints between the several lengths being carefully made, so as to be air-tight. The top of this tube terminates in an air-tight cistern, communicating with an air-pump worked by a steam-engine or other power; at the bottom of this cistern is a valve, to allow the water to escape when raised. The bottom of the tube extends nearly to the surface of the water in the sump, and is furnished with a piston or diaphragm sufficiently heavy to fall to the bottom by its own weight. From the bottom of this main tube, and beneath the piston, a smaller tube bends upwards, of sufficient height to be out of the reach of the water, and provided with a valve; and from a point, just above the piston, another pipe descends some feet into the water, which completes the arrangements. The *rationale* of the plan is this:—On exhausting the air from the cistern and tube, the water will flow in above the piston to a height corresponding with the state of exhaustion, or which may be regulated by the periods of opening the valve in the air-pipe.

Suppose a column twenty feet high has flowed in, when the valve in the air-pipe below being opened, the atmospheric pressure immediately forces up the piston with its load of water above, and, as the exhaustion continues, it quickly arrives at the top, overflows into the cistern, and the exit valve being then opened, runs off through the channel prepared for it; the equilibrium being now restored, the piston falls to the bottom by its own gravity, such fall being regulated by the admission of air at the top of the cistern; the cistern-valve and the air-valve are now closed, when the operation is repeated, and will go on *ad infinitum* while the air-pump is kept at work. It will thus be seen that after the first rise of water from the sump, due to the exhaustion, which we have taken at twenty feet column, the hydraulic principle is at an end, and on admitting air below the piston, the water is lifted the same as any other heavy body might be in the tube; in fact, it becomes a close atmospheric railway-tube with its load inside. A tube two feet in diameter will raise 440 gallons at each exhaustion, and if one exhaustion is made per minute, then that quantity will be raised per minute, which is above the average work of the largest Cornish engines.

By increasing the area of the tube, any amount of water may be raised per minute. If the pipe were three feet in diameter, then 880 gallons would be raised at each exhaustion.

One important feature of this invention is, that the water may be raised with any velocity, as its speed is never checked from the time it is set in motion till it is emptied into the cistern at the top. In first expense the saving would be enormous; in a shaft 300 fathoms deep, such a tube would weigh forty tons, at £25 per ton, would amount to £1,000, which, with the exception of the cistern and fixing, would be the whole cost. The timber-work required in the pit to support the tube would be very slight, as it would have only the tube to support, the water being supported by the atmosphere. This plan is equally applicable to underlaying shafts, and to shafts that are sinking, as ample provision is made for that purpose, also for preventing stoppage to the machinery, in the event of the shaft becoming flooded. The wear and tear and cost of maintenance will be very little, as there is only one piston for the deepest mine, and the wear of that is comparatively trifling, it being simply a diaphragm to keep the water compact; the liability to derangement is also very little, there being only one valve at the bottom, which valve is small, and not at all liable to get out of order, being in the air-pipe, and not affected by the water.

The piston may be taken out at any time when required, and replaced by a new one. Sand, grit, or any other substance will not in the least injure it, as it will be carried up with the column of water without the possibility of clogging the valve or piston.

The engine or water power may be at a considerable distance

from the pit's mouth, and may be made to unwater several pits at the same time.

The working railways by atmospheric exhaustion is a subject which is daily advancing in public estimation. It is evident, notwithstanding the partial failures that have hitherto impeded its progress, that it possesses inherent qualifications which will eventually make it the means of bringing about an important revolution in the railway system.

In constructing a railway on the atmospheric principle, in most cases nearly the surface line of country might be followed; bad gradiants would be no obstacle, for the power required in ascending an elevation is only in proportion to that elevation, and this would be compensated in descending, where the action of gravity alone would be sufficient, independent of any other aid.

The reduced cost of construction thus attained, added to the diminished outlay on permanent way, and this, combined with the great saving that would be effected in maintenance, owing to the reduction of wear and tear by the comparatively light weights that would alone pass over the line, would effect a saving in the outlay on railways beyond all calculation, and enable millions, now buried and wasted in the formation and preservation of costly works, to be employed in a vast extension of this important system of internal communication.

The grand distinction between a locomotive and an atmospheric railway consists in this,—that in the former, the propelling machine accompanies the train, and its construction and mode of operation are such, that a vast proportion of its power is necessarily spent in a wasteful manner, while in the latter, the source of motion being a fixed engine, advantage can be taken of the known economy of this description of machine, by which the expenditure of power is reduced to a minimum.

In the atmospheric railway, the fixed engine or motive power being made to act upon the train by means of pneumatic pressure brought to bear upon the piston of a tube in which a partial *vacuum* or exhaustion is produced, the chief merit of such tube must obviously consist in its capability of maintaining this *vacuum* unimpaired, and if at the same time it possess a contrivance for connecting the piston with the train, at once simple in action and free from the resistance of much friction, it becomes a perfect medium of communicating the power.

It will be seen by the following description of the elastic traction-tube, that it possesses the above requirements to a very eminent degree. This tube is itself a valve. It is constructed of plates of wrought iron, from one-eighth to a quarter of an inch in thickness, and in lengths of about nine feet. These are formed into tubes in the usual way, by means of rollers, and the edges planed, so as to come into accurate contact with one another. The tubes are fastened together at the ends by bands of corru-

gated copper, securely soldered to each of them, the ends of the tubes being made merely to abut one against the other, leaving sufficient space to allow for the expansion and contraction of the metal. The tube is supported at intervals of six feet on saddles in such a manner that its *weight*, in addition to its elasticity, always tends to keep the edges of the longitudinal slit in contact. The following is the mode adopted for opening the tube for the passage of the piston :—Affixed to the coulter-frame of the piston are four wheels, two in front and two behind the coulter, of such diameters that, on forcing them horizontally in the tube, they open it about five-eighths of an inch, and as they proceed the tube closes behind them. The friction from this arrangement is small, and the connecting-plate or coulter passes free, and the opening of the tube being effected by a compound rolling motion, is accompanied by little friction, which is still further lessened by the tendency of the tube to close behind, counteracting the force necessary to open it in front.

It will thus be seen, that in this tube the points of contact are metal surfaces, planed to a true and even line. It is at all times kept close shut by its own elasticity; and when exhausted, the metallic edges are held together by the pressure upon the whole external surface. No cavities can occur, therefore no sealing-composition is required; the only precaution adopted is to keep the joint slightly moistened with boiled oil. The labour of one man for a few hours in each week would effect this over a great number of miles.

This plan has been tested for upwards of two years on an experimental line at the Poplar station of the Blackwall Railway. It has been daily working for exhibition, exposed to all the shocks and vibrations of a heavy carriage passing over it at a velocity of twenty miles per hour. The elasticity of the metal is not in the least impaired, and the condition of the joint is rather improved by working than otherwise. It is found that the edges of the longitudinal slit come into sufficiently close contact to render the tube for all practical purposes perfectly air-tight, so as to admit of its exhaustion to any required degree by means of the air-pump.

The atmospheric system is capable of developing a new and greatly extended railway traffic. It is peculiarly adapted for running light trains at frequent intervals, and this may be done at a very low rate of charge.

It might also be adapted with advantage on those portions of existing railways where, owing to the steepness of the inclines, additional power is required.

In some localities natural water-power might be found in sufficient abundance to answer all purposes. It is needless to say how this would reduce the cost of working.

In first forming a railway adapted for the atmospheric system,

the expense of the tube will be saved by lighter rails, steeper inclines, and sharper curves, &c.

The cost of maintenance of the tube is too small to be taken into account, and the cost of maintenance of the permanent way will be reduced full one half, in consequence of the absence of the locomotive engine.

The system is equally applicable to mineral railways, for the same power which works the machinery for draining the mine, &c., could be applied to work the railway.

Atmospheric pressure may be also applied with great advantage to the working of pile-engines for forming coffer dams, foundations for buildings, &c., and sea embankments for reclaiming land.

In the common crab-engine the weight of the rammer is necessarily limited by the amount of manual labour that can be conveniently brought to bear upon it, and the necessary amount of force in the blow is made up by the *height* from which the rammer is made to fall. But it is found that a succession of short quick blows with a heavy rammer does the work not only with much greater speed, but in every way with greater efficiency, damaging the timber less, and, in fact, forcing it through hard ground, which by the old method, it would be found impossible to penetrate.

During the past few years many suggestions have been laid before the public for pile-driving apparatus which shall combine greater rapidity of action than by the tedious and slow operation of the monkey and crab of the old pile-engine, and at the same time be far more effective with greater economy. Of these, Nasmyth's direct action steam pile-machine is doubtless the most powerful, but it is at the same time costly; it is difficult to move about; the source of power, namely, the steam-boiler, being fixed to the same framing as the rest of the machine, causes it to be very heavy and difficult of transport, which confines its employment to very extensive works, and where large capital is at command. Dr. Pott's pneumatic plan is excellent, but not applicable to all descriptions of ground.

The great superiority of the atmospheric pile-driver is, that it may be worked at any required distance from the steam-engine and moved about with the same facility as a common crab-engine.

SIDE ELEVATION.

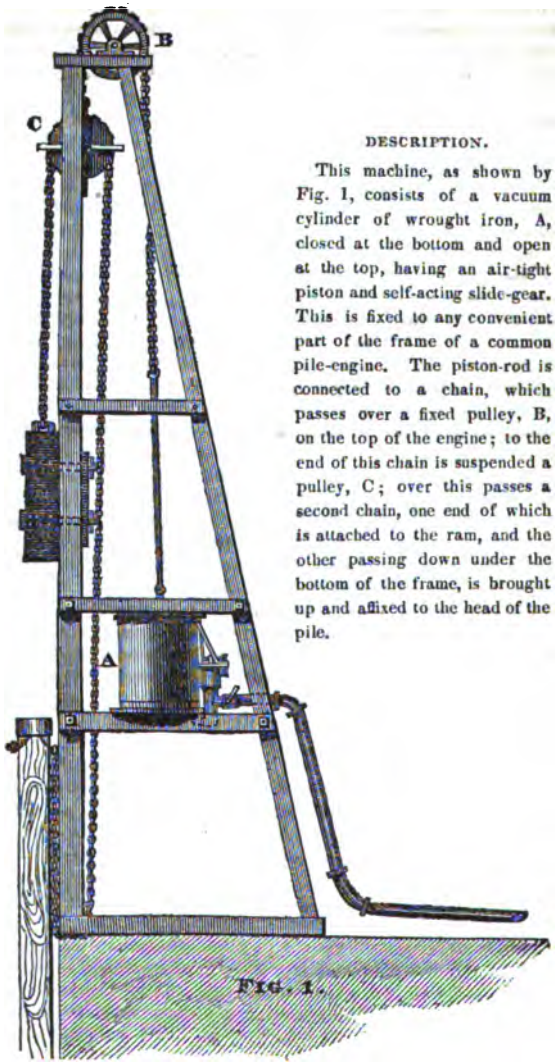


Fig. 1.

DESCRIPTION.

This machine, as shown by Fig. 1, consists of a vacuum cylinder of wrought iron, A, closed at the bottom and open at the top, having an air-tight piston and self-acting slide-gear. This is fixed to any convenient part of the frame of a common pile-engine. The piston-rod is connected to a chain, which passes over a fixed pulley, B, on the top of the engine; to the end of this chain is suspended a pulley, C; over this passes a second chain, one end of which is attached to the ram, and the other passing down under the bottom of the frame, is brought up and affixed to the head of the pile.

The power is derived from a small steam-engine, fixed at any convenient spot, which works an air-pump for producing the exhaustion. Communication is made between the air-pump and the pile-driving machine by small wrought-iron tubes, connected together by flexible joints of vulcanized india-rubber, and the mode of action as follows:—The ram being supposed down on the pile-head, and the piston consequently at the top of the vacuum cylinder, communication is opened by the valve-gear with the air-pump, exhaustion then takes place in the cylinder, the piston descends by the external pressure of the atmosphere and raises the ram; when the piston arrives at the bottom of the cylinder, the valves reverse themselves, communication with the air-pump is then shut off, and the external air admitted under the piston: equilibrium being now restored, the ram falls with the full effect of gravity on the pile; the valves are again reversed, and the same operation is repeated. Thus a succession of short heavy blows is given, rapid of course in proportion to the power of the steam-engine; and as by this arrangement of the pulleys the distance between the pile-head and the face of the ram is always the same, a regularity of action is obtained quite unknown to the old pile-driver, the injurious effect on the head of the pile, and rebound of the ram consequent upon great height of fall, avoided; and the ram being permanently fastened to the chain, the whole time lost by the re-attachment after every blow is avoided. The machine is so constructed that it may be fixed in a few hours to the frame of a common pile-engine.

The machine itself requires no attendance while in operation; only one man is employed occasionally wedging up the pile to preserve its true direction. It is moved with great facility from pile to pile, being very little heavier than the common crab-engine. Atmospheric exhaustion may also be applied with great economy *to boring holes for blasting*, *excavating*, and *splitting rocks*, as the power may be conveyed to any distance through small pipes of vulcanized india-rubber or gutta percha; any number of machines may be worked from the same motive power, and may branch off in different directions. For underground workings a pipe from the engine will descend into the workings and be there connected by flexible tubes to the different machines, either for boring holes or driving wedges, or for any other description of machine. For boring holes in a vertical direction, a machine similar to the pile-driving machine, with this alteration: instead of a pile a boring-bar would be used, a slight rotary motion being given it after each blow. For boring holes in a horizontal or inclined position, the machine consists of a small double or single-acting cylinder, mounted on a frame and hung on gudgeons, so as to vibrate in any direction; there are two slots in the framing, one on each side, to allow the cylinder to be raised or lowered, as required. The piston-rod, which is attached to the piston, is made hollow, through which

pass the boring-rods. On the bottom of the piston-rod is a collar of some elastic material, screwed up tight, through which the rod passes, and has sufficient grip to raise the rod with its load; but the momentum given on the descent of the piston is sufficient to throw the borer with great force into the rock below. On exhausting the air from the upper part of the cylinder, the piston is raised, and on admitting air it descends by the gravity of the boring-rods, &c.

This machine will bore holes, drive wedges, break up stones, excavate hard ground, either in a vertical, horizontal, or any other position, and be moved about with the same facility as a common wheel-barrow. In excavating stratified rock or colliery-work, several of these machines are placed alongside of each other, and a rammer attached to each piston-rod; wedges are then inserted in the fissures of the stones (or in holes previously bored for them), and driven in by these machines, cleaving off large masses at once. In other situations, instead of rammers or boring-tools, tools with points like pick-axes, or spades, to break up the ground, are employed, the machine having a progressive motion at the same time. This machine, by slightly altering the details, is applicable to every description of rock or hard ground, and may be employed in any situation. In like manner the principle may be applied to a portable stone-sawing machine for stone quarries. The following diagrams will show its construction and mode of operation :—

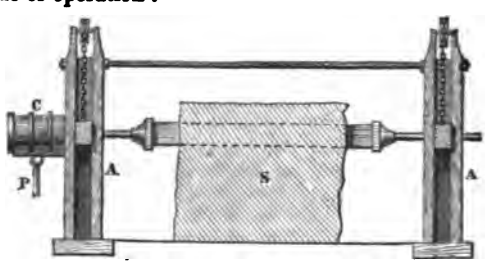


Fig. 1.—Side Elevation.

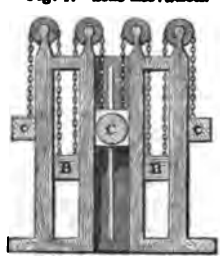


Fig. 2.—End Elevation.

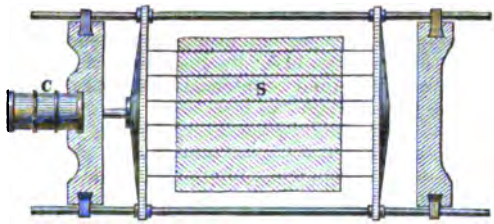


Fig. 3.—Horizontal Section.

S represents a block of stone or other substance to be sawn; C, a small vacuum cylinder, the piston-rod of which is directly attached to the saw-frame and slides, with the saws in a groove in the end of the frame. The cylinder is connected with the exhausting-pump by means of a flexible pipe, P. B B are balanced weights for the cylinder and saw-frame.

In some situations, instead of atmospheric exhaustion, steam may be applied direct from the boiler. The steam-pipe is made with joints, to allow for the cylinder to rise and fall with the saw-frame.

As relates to improvements in piles for foundations of buildings and other works, the pile is formed of two wrought-iron plates half an inch thick, twelve inches wide, and of any length that may be required. The top parts of the plates are riveted together, and the bottom parts are bent a little outwards from each other.

In driving, the plates are clamped, to make them stiff and prevent their bending under the quick heavy blows of the rammer.

The bottom ends of the pile, in consequence of being bent outwards, assume a curve, that when the pile is driven down to its head, the bottom ends are separated to about one-third the length of the pile.

If the pile is twenty feet long, then the ends will be seven feet apart, thus including a triangular base of earth to that extent which must be depressed before the pile can sink any further.

Timber piles may be formed in the same manner by being made in two parts and bolted together at their top ends; the bottom ends are shod with iron, with their points inclining outwards.

They may be made to assume any degree of curvature in driving by their points being made to incline more or less outwards.

This form of pile will support a greater weight without sinking than any other description of pile, and will be found extremely

valuable in soft ground for the foundations of any kind of buildings.

From the preceding observations on the various uses to which the principle may be applied, its great economy both in time and labour over the ordinary systems in use will be apparent.

BENEVOLENT INSTITUTIONS CONNECTED WITH MINING INDUSTRY.

BY THE EDITOR.

It would be most grateful to our feelings, if our pages recorded the existence of numerous charities, the object of which was to afford relief to the aged and decayed miner, and those associated with the trades connected with that branch of industry, to the members of which the present work is addressed; but we lament to say that with one exception, which we shall cite, the wealthy would appear to have but little regard for the wants or sorrows of those to whose labour and to whose intellect, in many instances, they are indebted for their worldly wealth. That there are numerous instances of individual kindness manifested, we admit; but while all trades and professions put forward their claims to public sympathy, and are aided by those members whose position in society enables them to lend aid and support to their impoverished brethren, yet the mining interest stands aloof. We refer more especially to our tin and copper mines, the annual produce of which may be taken at one million five hundred thousand pounds as the value of the ore alone, not to advert to our lead-mines, collieries, smelting-works, and other establishments closely allied with the metals we have named. We have before us, it is true, one solitary instance of an institution formed for relieving the distressed members of the iron, hardware, and metal trades; and we may here remark, that despite the importance to be attached to the iron-trade (we refer to the iron-master, the founder, the coal-owner, the merchant, the engineer, and those immediately associated with the application of the material), yet in seven years the amount of subscriptions and donations only amount to 3,949*l.* 13*s.*, and the number of annuitants being confined to nineteen. True it is, that the annual subscriptions have increased from 172*l.* 4*s.* in 1846, to 488*l.* 5*s.* in 1848; yet how small comparatively is such amount to the extent of the trade, as manifested in our pages by the returns presented. We can only express our sincere hope, that with the new year may

be infused those feelings of benevolence which have ever been our country's pride, and that we shall not have to refer to the absence of those feelings of humanity which we feel satisfied require only to be awakened to insure support to the several charities or institutions established for the common weal. They are in themselves instructive and beneficent, and little do we know who may be the first who shall become the recipient.

This institution was originated and established in London, March 24th, 1843, under the presidency of William Thompson, Esq., Alderman and M.P., the object being to afford permanent relief to deserving and necessitous members of the several trades comprehended in the designation of the Society, or to the widows of such persons.

The business of the Society is managed by a Committee of twenty-one subscribers, of whom one-third retire annually. All the offices of the Society are filled *gratuitously*.

Pensioners must be deserving and necessitous persons, immediately connected with the iron, hardware, or metal trades, or the widows of such persons.

It is not necessary that candidates should have been members of the Society.

No pensions granted are less than twenty guineas, nor more than twenty-five guineas, per annum. The payment of pensions quarterly in advance.

Donations and bequests, with the first year's subscriptions of new members, go to the formation of the permanent fund, and invested in public securities.

The annual general meeting is held in the month of March, for the purpose of receiving the reports of the auditors and committee, and election of officers.

The following statement shows the progress of the Society to the close of 1848 :—

	Donations.			Subscriptions.			Total.		
	£	s.	d.	£	s.	d.	£	s.	d.
In 1842	267	15	0	78	15	0	346	10	0
,, 1843	269	12	0	142	16	0	412	8	0
,, 1844	408	11	0	173	15	0	582	6	0
,, 1845	223	10	0	184	15	0	408	5	0
,, 1846	152	5	0	172	4	0	324	9	0
,, 1847	598	13	6	417	18	0	1016	11	6
,, 1848	370	18	6	488	5	0	859	3	6

The first election took place in September, 1846. Since then the number has increased to nineteen.

It is worthy of remark, that in the election of pensioners the country has fully participated in the benefits of the Society, notwithstanding the disadvantage under which those candidates may be naturally supposed to labour, in consequence of their remoteness from the centre of the Society's operations, and the disparity existing between the subscriptions of London and those more distant, the latter being contributed almost wholly by Birmingham and Sheffield, while the limits of Great Britain are those alone recognised by the Society as the bounds of its benevolence; it is therefore to be presumed that the merits of the Society require only to be better known to be acknowledged, to insure the support and assistance of firms in the country, associated with the several trades to the members of which this Society have so laudably directed their attention.

It is truly observed, in a pamphlet before us, that the history of the existing annuitants alone, if given in detail, would afford melancholy proofs

of the uncertainty of prosperity and the mutability of human affairs; while many have already derived important advantages from their position as member-candidates.

It is unnecessary further to follow the objects or the merits of the Society. Benevolence is its basis; and, with the numerous associations which have been formed for the relief of those whose age or disappointments in the world have reduced them to a state of poverty and want, this institution holds out a helping hand. Well, then, does it deserve the support of those who are able to render it aid; for we need not refer to individual cases to point out the instability of fortune, even with the most careful, or the uncertainty of life. Would that the mining interest followed the bright example here set forth; and we trust that ere the publication of another volume we shall have to record the establishment of a "benevolent institution for aged and decayed miners."

ON THE SUPERFICIAL PRODUCTION OF GOLD, OXIDE OF TIN, &c.,

OR ALLUVIAL METALLIFEROUS DEPOSITS.

BY E. HOPKINS, C.E., F.G.S.

It is well known that the largest proportion of gold is obtained from rivers and superficial deposits, in granitic districts. The quantity extracted from veins is comparatively small, less pure, and depreciating both in quality and quantity at moderate depths. Gold is always found in its metallic state, almost pure in alluvial deposits, but more or less alloyed when found in veins with other metals and minerals.

Primary rocks, composed of quartz and felspar, with a grey base, approaching to the character of porphyry, saturated with decomposed felspar, containing an excess of potash, with a small proportion of silica in solution, will, by time, produce a metallic efflorescence on the surface, and also fine crystals in fissures, and still more beautiful crystals in vacuities within the rocks. This variety of granite is more subject to form veins than the superficial production by decomposition. Gold and silver, and other metals least subject to oxidation, are commonly seen in a state of superficial efflorescence on the surface, and minute crevices of metalliferous rocks; so identical is the general appearance and the action of this metallic growth to that observed on the face of the negative plate of a battery immersed in a metallic solution, as to

render the analogy complete. The gold obtained from the washings at the foot of auriferous mountains is generally produced in this manner—that is, not from veins, but from a superficial efflorescence of the oxidated part of the crystalline mass. I have already alluded in my work on this subject to the slow chemical process which is constantly going on in all *moist* crystalline rocks, and that this perpetual action in the subterranean base gives rise to disturbances in the rocky structure, and also new production of metals, or rather causing a change from the fluid disseminated state to that of the aggregated crystalline solid state.

These metals, during the act of their new formation, are again subject to become alloyed, or mineralized, by other elements, according to their respective degrees of affinity and local circumstances. Gold and platina are little affected, but tin is subject to oxidation; their respective degrees of purity indicate the character of the mode of production. This process of perpetual change in the mineral kingdom is as constant as the action of the sap in the growth of vegetation. The surface of the auriferous granitics of South America and the Isthmus of Panama, especially those varieties subject to decompose in spherical exfoliation, show this effect in a very remarkable manner. In depth we find the uniform crystalline structure, which, by fine grinding and washing, produces but a mere trace of a yellow tinge of gold; as we ascend, the crystalline aggregation passes, by an almost imperceptible gradation, into a kind of globular structure, like a coarse conglomerate; the respective nucleus of each centre of attraction becomes denser and harder than the parent rock by the concentration of the surrounding silica, like the formation of flints in chalk. Each nucleus becomes enveloped by a series of concentric envelopes, which enclose, as this structural change approaches towards the surface of the rock, an efflorescence of ferruginous mineral, containing gold in minute crystals and in grains. These grey compact silicious centres are called by the native gold-washers in South America the "madres," or mother of the gold, as without these rounded nodules they seldom find sufficient gold in the debris to make it worthy of the labour of washing. The gold, as already noted, is in such a minute state of dissemination in the uniform crystalline base, as to make it almost difficult to detect the mere trace of it; but in the oxidated and decomposed crust the metals become aggregated to different centres, and form into grains, easily detected by the ordinary washing process. The terms *mines* and gold *ores* are extremely inappropriate to such deposits.

The stony nuclea, as well as the concentric rings, are completely deprived of their original auriferous contents by this process of internal aggregation. I have many specimens from gold-workings of the above character. After these oxidated

crusts are brought down by the torrents and washed away from the foot, or from the ravines of such mountains, the gold-washers must remove to other localities, or wait a few years until this slow process of Nature supplies them with a fresh crop, as they know to their cost that it would be useless to penetrate into the hard rock in search of the metal, as it must have a surface, vacuity, or a fissure, for its formation. Friable granites are exceedingly productive of alluvial deposits. A great portion of the green carbonates and oxides of copper are produced by a similar process in felspathic rocks. These kind of formations are very prevalent in the south temperate zone, and more common than the veinous sulphurets. The bog iron ore is of the same origin and also the mamillated peroxides of iron deposits, observed as incrustations of the argillaceous series. The gold deposits of California are precisely of the same character, the quantity of the available gold being limited to the amount of the decomposed debris accumulated in the ravines. I know of no primary rocks of the above composition of quartz and felspar, and the friable ferruginous granites, with bright yellow mica, but what contain gold.

Gold and tin, if not embodied, or overpowered, by strong polar substances, such as sulphurets of iron, copper, or other compounds of similar polar tendency, remain in the crystalline base in the disseminated state, they crystallize or effloresce towards the surface. If silicates happen to be in excess, they will produce a fissile structure, and the longitudinal action generated by which causes tension, and, consequently, a series of transverse fractures will take place; the surface of these internal planes becomes gradually coated by the metals the rock may contain, and thus forms veins. But if felspar happens to be the predominating ingredient, and this strongly saturated with iron, or any other substance susceptible of rapid oxidation, or, if the compound be very friable, the exfoliated decomposition will ensue, the free silica aggregate into centres, the felspar is reduced into clay, the metal collects into grains, disintegration takes place, and the thin, loose, friable surface is gradually washed into ravines; the heavier substances fall to the bottom, and accumulate in pools and other parts of the stream presenting the greatest resistance, whilst the lighter particles are washed away by the torrent. Such is the general character of the deposits of the gold and tin stream-washings. These deposits are, therefore, the product of friable metalliferous rocks, and not derived from lodes, the metallic contents of which can only become available by this process of slow decomposition. The value of these deposits depends on the superficial extent of the metalliferous rocks falling towards the head of the ravine, and the level of the plains, to receive the accumulations of centuries. It will be easily conceived, that works of discovery, carried into the hard crystalline base, *be-*

yond the deposit, in such rocks, must prove fruitless; and if such explorations be carried on by men who have no other knowledge to guide them underground than the occasional specks of mineral in the rocks, priany quartz, &c., their reports would be "kindly and promising" until doomsday, and, consequently, an immense capital would be wasted away in unprofitable works, and which has been the case in almost every gold-working carried on by Europeans.

Gold has been often found in the tin-streams of Cornwall, and is frequently associated with the oxides of this metal in the schorlaceous granites, and also in the ravines intersecting the ferro-felspathis rocks of Scotland; in every case it is found accompanied and often attached to the surface of yellow ferruginous quartz. This quartzose compound is easily recognised by those who have studied geology in the works of nature, or those who know the product of rocks from their structure and composition —the true science of geology applied to mines. When the gold was discovered in the streams of Ballin Valley, in the county of Wicklow, in Ireland, almost the whole population of the neighbourhood flocked, like the Californians, to gather so rich a harvest, and actually neglected at the time the produce of their fields. Stream-works were established, and continued for a few years, and the products left a surplus over expenditure, and some large lumps were found. This, however, was soon lost, as well as another capital added to it, owing to the mistaken notion of the existence of a *mother lode*, whence it was supposed the fine deposit of gold came from.

The best miners of the old school were consulted, and encouraged this idea; the solid mass was soon intersected by numerous trenches, levels, shafts, &c.; every quartz string was driven through, under the impression of finding the grand source of this wealth, but of no avail; with the exception of occasional grains in vacuities, or joints, nothing was found worthy of notice, and the undertaking was abandoned. Yet these same valleys still furnish a small amount of gold annually, and will continue so to do whilst the granitic domes remain subject to decomposition.

The Cornish miner, more especially in the stanniferous districts of Cornwall, is getting now so well acquainted with the character of the crystalline rocks, that he knows from mere appearance of a specimen what kind of granite will produce tin. Schorl appears to be an essential ingredient, or, at all events, a constant associate of the oxide of tin.

Near St. Austell, Dartmoor, and the Land's End, the oxide of tin is in some places so much disseminated through the schorlaceous granite as to render it worth quarrying for the extraction of the tin. All the metals that are found in this disseminated state are, as above noted, always more pure than when they are

found in veins. Those elements which produce joints and fractures, and the formations of veins in the crystalline base, effect the accumulation of the metals in the recesses, at the expense of a considerable amount of alloy of mineralizing substances, such as iron pyrites, the arseniate pyrites, &c.; consequently, metals obtained from veins are never so pure as those procured from the decomposition of metalliferous rocks; when dispersed in the latter, they are comparatively unalloyed. It is important to bear this constantly in mind.

The stanniferous, like the auriferous rocks, are often very friable, and subject to disintegration; the felspar decomposes into clay, according to the character of its component parts, an exfoliated oxidated crust is formed, which is gradually washed down to the ravines, where the several substances are deposited according to their respective gravity—the oxide of tin, being the heaviest, will occupy the lowest beds in each accumulation. There was a time when miners did fancy that these alluvial deposits of minerals came from lodes, and geologists considered lodes as volcanic productions, but, fortunately for our industrial science, such erroneous notions are now almost matters of history. Some vain attempts have been made to determine the age of this superficial detritus of stream tin, and its associated gravels, but to no purpose; it is like that undefined and improper term, *tertiary*—it belongs to all ages.

Sometimes we find the tin-stone pebbles, the comminuted quartz grains, and the oxide of tin, left behind on the parent rock, and the decomposed felspar washed away, and this covering becomes so thick as to prevent farther decomposition.

In the Indian Archipelago the same phenomena occur, especially in the island of Banca. This island, with its ridges, conforms in its direction to the Asiatic ranges of mountains, and is composed principally of granite, both ferruginous and schorlaceous—the predominance of the former giving it a general red colour. The oxide of tin is disseminated more or less throughout the schorlaceous granite, and is found in beds at the foot of the granitic range, either immediately under the surface, or at no great distance below it—the greatest accumulations are mostly found in low situations near the schorlaceous ridges. These deposits are composed of clay of various colours, from pure white to yellow and red. The most productive beds of tin ore have been found near the central parts of the peninsula, at the junction of the districts of Sungie-bulu, Klábbet, and Tengá.

The lowest bed is generally of the purest white colour, very light, and adheres strongly to the tongue, like pure clay, on which the ores of tin are deposited in layers differing in richness and extent, according to the locality and the quality of the parent rock. Sometimes the tin is found dispersed through the whole of the bed, commencing immediately under the soil, and

increasing in quantity towards the bottom. The schorl in the granite is often seen in black strings, intersecting each other at different angles, and also in elegant needle-form crystals adhering to the fragments of quartz, and likewise disseminated through the quartz in minute rhomboidal crystals, which renders the granitic mass loose and friable. In some parts the minute particles of schorl are barely perceptible; in other portions this substance is uniformly mixed throughout the stone; and again, the granite changes into a different compound, in which schorl cannot be detected.

In all the stanniferous granitic rocks the mica is but sparingly distributed, the admixture being quartz, felspar, and schorl in variable proportions. The exfoliated beds formed by decomposition *in situ*, on the surface of the granite, consist of fragments of quartz and felspar, with small particles of schorl, and the ore of tin. Sometimes coarse fragments of decomposed granite are seen with breccia, through which the oxide of tin is disseminated. The *productiveness of the deposits of the valleys gradually diminishes as the acclivity of the hill increases*, similar to that already noted in gold-washings, and thus plainly shows the origin of these alluvial metallic deposits. All persons engaged in such works should never forget this most important fact in alluvial deposits. These superficial processes of decomposition and deposit are constantly going on in every region on the face of the earth where the primary rocks are exposed to the atmosphere.

ON THE UTILITY OF A KNOWLEDGE OF ASSAYING AND ANALYSIS IN THE TREATMENT OF METALLIC ORES IN THE SMELTING PROCESS.

BY P. N. JOHNSON, F.R.S., F.G.S., ETC.

NOTHING more clearly proves the want of knowledge of our forefathers in metallurgical and chemical operations, and their ignorance of the constituents of the minerals from which they produced their metallic results, than the refuse of their operations in the form of slags or scoria, and the remains of the rudely-constructed furnaces they used, and it is only within the present century that works of this nature seem to have been conducted on anything like scientific principles. It is true that where there is abundance of material there is too often waste, and this may in some measure account for the richness in metal of some of the slags;

but it is evident that had the former operators been properly informed in their business, they would have extracted the full produce of their minerals. From the enormous quantity of slags in various parts of the kingdom in the lead districts, it is evident they could not have properly prepared the ore for smelting, as if the ore was dressed to a high produce, there could have been but little scoria formed, while on the Mendip hills we find these slags existing in some places to a depth of thirty feet, and covering an area of ground reaching more than a mile in length, and nearly the whole breadth of the valley, and by assay containing from 15 to 45 per cent. of metallic lead. Had assaying been understood at the time these ores were worked, it is evident that the ancients would have found some of their refuse to contain more lead than some parcels of ores which they subjected to their rough smelting process. The same observations might also be made respecting the sharp slags of the iron-works, and even of late date the metallic contents of the copper slags. But let us see under the different heads how far the knowledge of assaying and analysis is useful. I would say in regard to the former, that the books of every well-regulated smelting establishment should prove its utility by showing that the produce, within certain limits, should correspond to the amount calculated by assay from the bulk of mineral operated upon. This is considering assaying as only giving the quantity of one or two metals, as lead and silver in a given weight; but should it be proved that such gross produce is not (as before said, within certain limits) equal to the assay in working on a large scale, it is evident there is some cause for it, and the only remedy to improve the process, is a knowledge of the constituent parts of the mineral or scoria, formed by analysis, as the manner of treating metallic ores depends upon the state of mineralization of the metallic contents, and the description of its earthy matter.

Metals in a state of oxide are very liable to combine with the earthy gangue in a state of fusion, as is shown in the article of glass, one sort of which may contain from 15 to 20 per cent. of lead, and yet remain clear, in fact its transparency improved, and therefore not detectable except by analysis; and the various colours given to glasses are from proportions of metallic oxides in a state of vitrification, with the silica and other compounds. Thus, then, by the knowledge of metal existing in a state of oxide we know that a proportion of carbon is requisite to produce it in a metallic state. Where sulphur is by analysis proved to exist, it shows the necessity of adding some substance in the reduction (as lime or iron), which has a nearer affinity for the sulphur than the metal to be reduced; when arsenic is present, the necessity of calcination previous to reduction of the other metal (as tin, &c. &c.), in order to prevent injuring its quality; and in fact the whole list of metals might be gone through to show what

effect would be produced in the smelting process by a want of knowledge of the other metallic constituents, and the state of mineralization in which they exist, and this only can be ascertained by analysis; but, above all, in order to produce the largest proportion of metal in the smelting process, it is requisite to know the proportion of the different earthy constituents of the ores, as on this depends the admixture of other earths, so as to produce a slag at once readily fusible, and in such proportions as to form a perfect vitrifiable scoria, without the combination of any metallic oxide; or if they do contain any, only such as are not required to be reduced to a metallic state. Thus it will be seen that a knowledge of analyzing these scorias will be of twofold advantage: first, to see what metallic oxides they may contain, and the proportions; and secondly, whether the proportion of earthy matter is in such quantity as to form the silicates, with other compounds, without the metal required to be reduced.

EXPLOSIONS OF FIRE-DAMP CONNECTED WITH FALLS IN THE BAROMETER.

COMMUNICATED BY PROF. D. T. ANSTED, ETC.

State of the Barometer on the days of the principal explosions which have happened in the Northern Collieries during the last forty years, compiled mainly from the register kept by the late Mr. Losh, at Gesmond Grove, and that of the Literary and Philosophical Institution of Newcastle:—

Date.	Collieries.	Killed.	Day before Explo.	Day of Explosion.	Day after Explo.	Wind.	Weather.
Sept. 25, 1803..	Wall's End	13	30·30	30·20	30·30	—	Fair.
Oct. 21, 1805..	Hebburn	35	30·25	30·20	30·15	N.	Fair.
Nov. 29, 1805..	Oxclose	38	29·90	29·40	29·03	E.	Fair.
Nov. 28, 1806..	Killingworth	10	29·90	29·93	30·03	S.	Fair.
Nov. 29, 1808..	Harraton	4	29·65	29·45	28·90	N.	Fair.
Sept. 14, 1809..	Killingworth	12	29·50	29·50	29·80	E.	Fair.
May 25, 1812..	Felling	92	29·90	29·85	29·80	W.	Fair.
Oct. 10, 1812..	Barrington Mill Pit..	24	29·35	29·35	29·30	S.E.	Fair.
July 17, 1813..	Collingwood Main..	8	29·50	29·70	29·85	W.	Fair.
Sept. 28, 1813..	Hall Pit, Fatfield ..	32	29·95	30·05	30·20	E.	Fair.
Dec. 24, 1813..	Felling	22	29·70	29·85	29·90	S.E.	Fair.
April 5, 1814..	Hwden Pit P'rcy Main	4	29·60	29·60	29·80	W.	Fair.
Aug. 12, 1814..	Hebburn ?.....	11	29·80	29·60	29·40	S.W.	Fair.
Sept. 9, 1814..	Leefield	4	30·00	30·00	30·00	E.	Fair.
June 2, 1815..	Sheriff Hill	11	30·20	30·10	30·10	S.W.	Fair.
Dec. 18, 1815..	Townley	1	28·90	29·15	29·20	S.W.	Fair.
June 20, 1817..	Row Pit, Harraton..	38	29·65	29·50	29·35	S.W.	Rain.
Sept. 25, 1817..	Jarrow	6	29·80	29·30	28·70	S.W.	Fair.
Aug. 5, 1817..	Wall's End	4	29·50	29·80	29·80	S.E.	Fair.

Date.	Collieries.	Killed.	Day before Explo.	Day of Explosion.	Day after Explo	Wind.	Weather.
Nov. 2, 1817..	Ouston	1	29·70	29·90	29·80	S.E.	Fair.
Dec. 16, 1817..	Plain Pit, Rainton ..	27	29·20	28·40	28·70	S.E.	Fair.
July 19, 1819..	Sheriff Hill	35	29·40	29·50	29·10	S.	Fair.
Oct. 9, 1819..	George Pit, Lumley..	13	29·70	29·60	29·40	S.	Fair.
Oct. 19, 1821..	Nesham's, Newbottle	6	29·55	29·45	28·60	S.W.	Fair.
Oct. 23, 1821..	Wall's End	52	28·90	29·00	29·25	S.	Fair.
Oct. 23, 1821..	Felling	6	28·90	29·00	29·25	S.	Fair.
Feb. 21, 1823..	Ouston	4	29·60	29·00	29·15	S.E.	Rain.
Nov. 2, 1823..	Plain Pit, Rainton ..	59	29·90	29·60	29·40	S.E.	Fair.
Oct. 5, 1824..	George Pit, Lumley	14	29·50	29·10	28·70	S.	Fair.
Nov.19, 1824..	Dolly Pit, Newbottle	11	29·15	29·50	29·40	S.W.	Fair.
July 3, 1825..	Julit Pit, Fatfield ..	11	29·80	29·65	29·80	W.	Fair.
Oct. 5, 1825..	Hebburn	4	29·45	29·55	29·55	W.	Fair.
Jan. 17, 1826..	Jarrow	24	30·35	30·25	29·95	S.W.	Fair.
May 20, 1826..	Townley	28	29·75	29·75	29·65	N.E.	Fair.
Sept. 5, 1826..	Heworth	5	29·50	29·55	29·20	N.E.	Fair.
Oct. 27, 1826..	Benwell.....	2	29·20	29·25	29·60	N.W.	Fair.
Mar.15, 1828..	Jarrow	8	29·95	30·00	29·80	S.E.	Fair.
Sept. 1, 1828..	New Pit, Houghton	7	29·80	29·70	29·70	S.E.	Fair.
Nov.20, 1828..	J. Pit, Washington..	14	29·60	29·50	29·30	N.W.	Fair.
Dec. 3, 1829..	Willington	4	29·60	29·40	29·60	S.E.	Fair.
Aug. 3, 1830..	Jarrow	42	29·10	29·40	29·80	N.W.	Fair.
July 9, 1831..	King Pit, Wreckingtn	3	30·00	29·90	29·90	W.	Fair.
Sept.20, 1831..	Willington	7	29·53	29·50	29·50	S.E.	Rain.
May 9, 1833..	Springwell	47	29·85	29·60	29·75	W.	Fair.
May 24, 1833..	Great Lumley	2	30·10	30·05	29·80	S.E.	Fair.
Nov. 1, 1833..	Black Fell.....	3	30·06	30·07	30·04	—	—
June18, 1835..	Wall's End	102	30·09	30·11	30·10	—	—
Nov.19, 1835..	Burdon Main	11	29·66	29·84	29·85	—	—
Jan. 22, 1836..	Down's Pit, Hetton..	22	29·91	29·62	29·34	—	—
Dec. 6, 1837..	Springwell	30	30·37	30·12	29·80	—	—
Dec. 19, 1838..	Wall's End	11	30·31	30·22	30·20	—	—
June28, 1839..	St. Hilda	51	29·89	29·68	29·95	—	—
June 6, 1840..	Haswell.....	1	30·05	29·87	29·83	—	—
April 19, 1841..	Bigge Pit, Willington	32	29·65	29·65	29·62	W.	Fair.
Aug. 5, 1841..	Thornley	9	29·60	29·32	29·48	S.S.E.	Fair.
Aug.17, 1841..	Haswell.....	1	29·78	29·78	29·73	—	—
Mar. 2, 1842..	West Cramlington ..	1	29·21	29·48	29·53	N.W.	Rain.
April 5, 1843..	King Pit, Wreckingtn	28	29·29	29·44	29·58	W.N.W.	Fair.
Jan. 18, 1844..	West Moor	5	30·13	30·06	29·93	W.N.W.	Fair.
Sept.28, 1844..	Haswell.....	95	30·012	29·852	30·122	W.N.W.	Chan.
Oct. 15, 1844..	Coxlodge	1	29·92	28·83	28·83	W. by N.	Fair.
Dec. 1, 1844..	Seghill	2	30·18	30·15	30·07	S.	Dull.

ON THE GENERAL CHARACTER OF THE CRYSTALLINE ROCKS CALLED "PRIMARY,"

AND THEIR HIGHLY SATURATED STATE IN SITU.

BY E. HOPKINS, C.E., F.G.S.

THE first and universal fact that presents itself to our notice, when we examine the nature of these formations, is, that they contain a very considerable proportion of water, and are commonly found as soft as clay in depth; indeed the superficial part of these rocks is the driest and hardest portion of the mass. Nothing is more common than mineral and saline springs gushing out of the primary series, and these forming incrustations of mineral matter by precipitation. There is scarcely any spring water which does not contain silica in solution, though frequently in very small quantities.

In South America great streams of silicious and calcareous matter are seen issuing out of the crystalline rocks and forming large deposits. Large trunks of trees and timber, in old mines which have been long under water, have been found silicified in a comparatively short period. Even vegetation contains a proportion of silica taken up by the roots, and crystals have been found within the cells, and often large ones in the bamboo. There are immense forests of silicious and calcareous stumps, in their natural *growing* position, in Chili, Veraguas, in Australia, Egypt, and other places in the southern hemisphere, showing most distinctly that the trees became silicified when in the act of growing, by an excess of silica and lime getting into the soil. The upper part having decayed, the whole forests appear to have been snapped off by the winds nearly at the same time; the brittle character of the stumps causing them to break off as if they were sawn horizontally a few feet from the bottom.

In springs predominating in calcareous matter during deposition the silica becomes aggregated into small round lumps, like flints in chalk, forming a nucleus to all the bordering silicious fluid. A similar phenomenon is observed also during the process of petrifaction; trunks are sometimes converted into a calcareous matter, the silica by degrees appears in the centre, from which point it expands, and the lime is forced outwards towards the external margin of the petrified body.

In mines and all subterranean caverns in the primary rocks, mineral springs and the production of crystals are as constant as the growth of vegetation, and these are formed proportionably to the strength of the solvents.

The same composition always crystallizes in the same form, unless the conditions of the crystallizing body are altered. It has been shown that each particle of a crystalline body has certain points called "poles," which possess definite properties, somewhat analogous to the opposite functions of the roots and leaves of a tree, being two distinct points diametrically opposite in the greatest activity of converging and diverging actions. This polarity of the particles of matter has been referred to the influence of the universal terrestrial polarity in which we are all enveloped; a power which is as active in what we call vacuo, as it is in the rocks, in the sea, or the open air.

The animal and vegetable tribes cease to continue the functions of life and a complete disorganization takes place in the final decomposition, but this is not the case in the mineral kingdom; the crystal, being the result of a constantly acting force, although decomposed and dissolved, will again appear in all its perfections.

In the deep recesses of the crystalline film permeated with the subtile powers of polarity, beneath the scene of life, a never-ending process is going on; giving form, decomposing and reproducing the aggregated crystalline compound which we denominate the "primary series."

Every elementary body when placed under circumstances which allow of the free movement of its molecules, has a tendency to crystallize, and the slower the action the more perfect the crystal.

Water holding lime in solution is colourless and perfectly transparent. Let the water slowly evaporate, and the crystals will appear in their usual form and refracting character. These crystals gradually grow until the aggregated calcareous mass form a symmetric figure, the primary form of each individual crystal being a rhomboidal prism.

A crystal thus produced may with propriety be called "primary," as it is formed from the solution of a primary element, like the crystals of chloride of sodium, sulphate of lime, magnesia, &c. &c., from the sea, into definite forms, according to exact laws; and the comminuted powder and decomposed crystals forming clays, sands, &c., reconsolidated by any cement, may be called a "secondary" or "sedimentary" formation. Therefore, the terms "primary" and "sedimentary" rocks, used here, are to be considered in the same sense, having no refernce whatever to the time of their formation.

With regard to the interior of the globe below the "primary film," nothing can be determined from immediate observation, or by legitimate induction from data founded on experiments, nor is the question essential to our inquiry.

I am well acquainted with the common statements, copied from book to book, of Maskelyne's experiments, and Cavendish and others, with delicate instruments ascertaining the attraction

of masses upon each other; and applying the powers of arithmetical calculation, and the data obtained from the small experiments, to the large phenomena, the earth's mean density is found by some 4·71, and others 5·48.

From data thus obtained not alone the earth's density is supposed to be ascertained, but also the distant planets.

It has been already stated that we are always enveloped in that great polar power we call magnetism, which, with the most impermeable envelopic substance we can employ, and the most perfect air-pump to exhaust, we cannot extract nor weaken its powers. Its directive polar force, its attractive power, and its effect on matter to crystallize, &c., actually increases within an exhausted receiver.

By experiments we find that the attraction of a hollow shell of a certain thickness is equal to a solid one; hence we cannot determine the quantity of matter, or the density of a spherical body, by data founded on superficial attraction. The tangent of deviation is directly proportioned to the cube of the diameter, and wholly independent of the state of the interior.

Much importance is placed also by some geologists on the degrees of increasing temperature found in our mines to prove igneous fluidity in depth.

The greatest depth towards the centre, ascertained by us, is the bottom of the ocean, which (within the tropics) is much colder than the surface, indicating universally that the heat affecting the surface is solely derived from the sun.

The few, and comparatively insignificant, perforations we have made into the crystalline film are confined to those spots containing minerals in excess, and, consequently, the seats of chemical activity, and where fresh oxygen is brought in contact with substances to which it has a great affinity, and heat generated during oxidation, &c. &c., therefore, even were there an uniform scale of increasing temperature observed (which is far from being the case) it would not serve as data to found such calculations.

In our investigation of phenomena dependent on natural causes, certain laws of reasoning should inviolably be adhered to. First, no cause should be adduced whose existence is not proved, either by its effects, or by a true process of induction. Secondly, no effect should be attributed to a cause whose known powers are inadequate to its production. Thirdly, no powers should be ascribed to an assumed cause, but those that it is known to possess, according to the laws of terrestrial physics. And finally, no assumed powers should be brought forward to explain effects which are produced by the ordinary powers of nature.

If we strictly conform to the above rules, we shall find that the great terrestrial polarity enveloping our planet accounts for all geological changes in rocks and on the surface, individually and collectively.

We have no proof of the existence of an igneous element in a quiescent state, and much less confined within a sphere. Granting its existence, it could not produce a solid, but merely the melting of a substance already formed; therefore there is nothing gained even by the application of such an hypothesis as *igneous* rocks.

It is extremely difficult to produce crystals from fusion, and those which are imperfectly formed are produced when in the act of very slow sublimation; whereas, silicious and calcareous crystals are not only daily formed in nature from aqueous solutions, but all substances can be crystallized, in the moist way, under the influence of a polar force by artifical means, but not by igneous fusion.

The crystals forming the primary base could never be imitated by fusion, even though every other circumstance should concur, and especially those with or without an intermediate prism, terminating with pointed pyramids at both ends. Even those rocks called ancient lava, such as basalt, trap, greenstone, and other variety of the hornblendic series, are of the same aqueous composition as any other rocks; their pores are always filled with mineral salts.

All the rocks, even the most solid and compact, lose a large portion of their weight when exposed to a strong heat, and many decrepitate; the weight thus lost is mere water. Zeolytes lose from 5 to 18 per cent.; compound spar, about 45 per cent.; opals, from 6 to 18 per cent.; schorl, from 7 to 15 per cent.; Brazilian topaz, 20; common flint, 5; red quartz, 3 per cent.; and quartz is also often found hollow and filled with water. In short, water in some proportion seems an essential ingredient in all rocky crystals, and a supersaturation of an alkali will reduce the crystalline into an homogeneous compound, and *vice versâ* in the ordinary temperature.

There is scarcely a substance known but what is either found in solutions or may be dissolved in an aqueous alkaline menstruum.

The apparent insolubility of quartz gave rise to some of the difficulties which at one time embarrassed geologists; but, as above stated, silica is not only found in solution, but easily dissolved in caustic alkali, and may be obtained like gum-water or glue, perfectly transparent and of great tenacity; like indian rubber, possessing the plastic properties of putty or fine clay. The same plastic character is often found in the felspathic granites in great depths.

The ocean may be considered as the primary menstruum from pole to pole, as slightly sketched in another chapter, a compound of all the elements in solution through which the polar force permeates from the *diverging* to the *converging* focus of activity. From analogy, and according to many experiments made with

a battery in connection with a globe of 10 inches diameter, crystallization commences at the diverging or hydrogen pole, and these crystals form lines until they extend to the converging or oxygen pole in symmetrical meridian lines, and thus producing a polar grain from pole to pole. The extreme ends of these linear crystalline growths oxidate as they approach the north or pole of convergence, and as fast as this end is oxidated and dissolved, the same amount of new crystals is formed at the diverging pole, and both crystals and water are constantly propelled from the hydrogen to the oxygen poles, or, in other words, from south to north; the same as we see in nature the northward currents of the Pacific and Atlantic oceans, and the northward action of the polar cleavage of the primary rocks.

In the primary rocks we recognise in every crystal, and the compound crystalline masses, the action of the constant and undeviating forces of polarity and chemical affinity, giving to each mass a polar grain, and to every crystal a definite form and composition. Hence the above may be considered an experimental demonstration of the observed natural truths, and totally free from all assumptions, and as useful in practice as correct in principle, which is the true and proper test of a correct theory.

The principal elementary substances entering into the composition of the crystalline rocks may be considered the following:—

Silica.	Lime.	Carbonic acid.
Alumina.	Iron.	Sulphuric acid.
Magnesia.	Manganese.	Muriatic acid.
Potash.	Fluoric acid.	Nitric acid.
Soda.	Boracic acid.	Water.

The aggregated crystalline compound consists of the above in a state of fluids, semi-fluids, and solids; the separate elements in different stages and degrees of crystallization.

Silica forms	Quartz.
Silica, alumina, lime, and potash	Felspar.
Silica, alumina, potash, and iron	Mica.
Silica, alumina, magnesia, and iron	Chlorite.
Silica, magnesia, and potash	Talc.
Silica, alumina, magnesia, lime, and iron	Hornblende.
Silica, alumina, magnesia, potash, and iron	Schorl.
Lime and carbonic acid	Carbonate of Lime.
Lime and fluoric acid	Fluor spar.
Lime and sulphuric acid	Sulphate of Lime.
&c. &c. &c.	

Besides the above ingredients, there are also disseminated in the crystalline rocks all the known minerals, and these even may likewise be compounds of which hydrogen forms a part.

Hydrogen gas dissolves iron, zinc, arsenic, sulphur, carbon, &c. &c., and from combinations thus formed we can with facility

separate these elements; such substances may exist in rocks, and in our atmosphere without our being cognizant of them.

The aggregation of the above crystalline substances constitutes what we call *granite*, and which we necessarily consider as the primary crystalline base of all our known rocks. Numerous names have been given from time to time to the different kind of granites, but it is very evident that such distinctions can only be governed by the predominance of some and the deficiency of other ingredients in the compound.

The granites, porphyries, and elvans of Cornwall, taken as masses, are essentially of the same chemical compositions, and merely subject to minor variations arising from the presence or absence of schorl, talc, mica, or the quality of the felspar and mineral contents.

In order to have some idea of the general character of the granitic base, as observed in both hemispheres, we shall enumerate the following:—

Quartz, felspar, and mica	Common micaceous.
Quartz, felspar, and talc	Talcose.
Quartz, felspar, and chlorite	Chloritic.
Quartz, felspar, and hornblende	Hornblendic.
Ditto as an homogeneous compound	Basalt, Trap, &c.
Ditto with crystals of felspar	Porphyritic.
Quartz and talc	Quartzose.
&c. &c. &c.	

Felspar in general constitutes by far the largest part of granite, and is the active agent of decomposition.

When silicates, mica, talc, &c. predominate, these crystalline flakes are gradually drawn as it were from the base into a fibrous or laminated structure, the respective ingredients (as explained in another place) become formed into vertical parallel plates, known as cleavage or polar structure. This change is always found in meridional bands, indicating the influence of polarity in the molecular arrangement.

This elongated structure or laminated granite is called *gneiss*, being identically the same chemical compound as the base; the transition of the crystalline aggregation to the laminated structure is necessarily insensible, the action being like a simultaneous polar growth of the respective variety of granites northward; hence a micaceous granite produces micaceous gneiss, chloritic granite, chloritic gneiss, &c.

Schist and *clay-slate* form the termination of the great grantic masses, their respective oxidated crusts, branches, and leaves as it were of the great granitic trunks. The mica granite passes first into gneiss, then into mica schist, by an almost imperceptible gradation.

This part of the primary is often confounded with sedimentary rocks, and, from its constant state of activity, it frequently

obliterates sedimentary seams and cleaves the superficial beds at right angles to the horizon, giving the superincumbent strata a polar structure.

It is the final decomposition of the felspar between the plates of mica and quartz that distinguishes slate or schist from gneiss.

The felspathic granite, especially when supersaturated with lime or potash, never produces the above schistone variety, but exfoliates or changes into brown compact clay, a compound of an hydrous silicate of alumina, variously coloured according to the quantity of oxide of iron present.

It is within the limits of this transition of the crystalline base into the oxidated compound that the minerals become developed in veins, &c., neither very deep into the perfect crystalline, nor yet near its termination into clay. Even the plombiferous limestone is found, directly or indirectly, within the influence of calcareous porphyritic granites, and when not in contact, channels of communication are effected along the meridional splits and cleavage planes.

Each series of granite and schist, or granite and clay-slate, belongs to one formation, and each variety along the line of cleavage is essentially composed of the same minerals, variously modified, decomposed, &c., by polar influence and their individual chemical affinity; passing by insensible gradation from the base to the slaty structure, in vertical plates in meridional direction, and finally into massive clay, and subject to constant changes and disturbing local causes.

Besides the regular transition of the crystalline base into slate, &c., there are also veins formed interlaminated in the masses: should the base contain a large proportion of silica, quartz veins will be formed; if calcareous, carbonate of lime; excess of magnesia, serpentine veins; this again united with hornblende and lime, with iron and carbonic acid, will form veins of basalt, trap, &c.; and these varieties are the most active compounds in all rocks in every part of the world. The felspathic variety is the richest for minerals in Chili, Peru, Quito, New Granada, Mexico, England, Germany, and Norway. The quartzose granite and the homogeneous dark hornblendic, the most unproductive.

When granite forms a moist, massive grey base, it is seldom deficient in mineral, but when comparatively dry, with a distinct crystalline grain without a base, it is generally poor in mineral. The metalliferous parts of Cornwall have a porphyritic granite, which on the surface is partially decomposed or changed into compact brown rock (killas), and the intermediate part is called elvan, a fine-grained porphyry. The presence of talc and white mica indicates scarcity of minerals.

The first fractures produced in any series of rocks are filled with the predominating elements, silica, alumina, lime, &c., and

minerals only become formed after these are nearly exhausted in the respective metalliferous bands.

As the process in the primary rocks is constant, and the pores and cleavage being always more or less charged with mineral solutions, and subject to variable tensions, fractures, &c., the structure of the compound becomes occasionally very complicated, by which cause the phenomena of heaves, splits, veins, &c., are produced.

In Chili, Peru, New Granada, Canada, and Norway, grey ore, native copper, and flakes of native silver, are frequently found diffused or interlaminated throughout the entire micaceous schist, and gneiss.

The formation of sulphuretted ores was formerly considered as scarcely explicable in the moist way, sulphur being supposed insoluble in water; but we find numerous springs issuing out of the crystalline series holding sulphur in solution, sulphuretted hydrogen, &c. &c.

A cubic foot of water may contain about 400 grains of sulphur. Carbonate of lead is soluble in alkali and lime, and may be precipitated therefrom by sulphuretted hydrogen. Lead is more attracted by lime than by other earths, and limestone formations contain lead in preference to other metals.

Pieces of timber have been found in the mines of South America covered with silicious and calcareous spar, grey and red silver, copper and iron pyrites. What is called by miners "young mundic," is of common occurrence. There are now many old exhausted mines in South America and other places actually reworked, the subsequent crop of minerals in a state of efflorescence on the walls, and on the rubbish, being sufficient to pay for the labour.

ON TIN ORES AND BLACK TIN.

BY P. N. JOHNSON, F.R.S., F.G.S., ETC.

HAVING lately been engaged in experiments on the tin ores and black tin of Drake Walls Mine, with the object of ascertaining the best method of destroying other metalliferous minerals with which the native oxide is combined, and in calculations as to the relative value given by the tin smelters, for the absolute contents of white tin in various qualities of ores, you may, perhaps, con-

sider them worthy of notice. I should first observe that I have always, in assaying black tin (instead of calcining), adopted the means of separation of such extraneous matter as is capable of solution, by digesting a given weight as sample alternately in nitric and muriatic acid, usually taking 100 grains for this purpose; and, from showing this in my laboratory, was, I believe, the originator of the application on a large scale for cleaning tin, although this, of course, can never be so effectual as the assay, where the cost of acids is of no importance. By thus treating the sample of tin, it will be seen that all other injurious mixtures are separated except specular iron, and one or two other minerals of iron and silica; and should there be a considerable proportion of the latter, it can (after the action of the acids) be mostly separated by carefully washing, and, where wolfram is present, the addition of a small quantity of caustic ammonia will take up the yellow tungstic acid, after dissolving the iron which forms the other constituent. I then place this cleaned black tin in a charcoal crucible, inserted in one of clay, and filling up with charcoal dust, first mixing the tin with a small quantity of lime, in proportion to the silica present, in order to engage with it, and prevent any of the oxide of tin being combined; the result is a button of pure white tin, equal to any reduced from the best stream tin; the time occupied in the reduction is about twenty minutes, at a very strong heat—say, good white heat. In nineteen cases out of twenty the tin produced is perfectly pure, and, on re-melting, will show no crystalline appearance in cooling; but in the event of any combination of iron which has been insoluble, as before alluded to, I flat out the button, and digest a portion (say seventy grains) in nitric acid with its own bulk of water, until the tin is formed as a pernitrate, when the proportion of iron can be closely ascertained, by addition of caustic ammonia to the solution, after washing the pernitrate of tin in a filter—the peroxide of iron being collected in another filter, washed, dried, and heated in the usual way.

I have thus been particular in developing the plans I pursue in assaying, in order to show that my calculations of prices given by the smelters are founded on true data, and the necessity or desirableness of getting the black tin of as great purity as possible, even at an expense which, in the first instance, would appear startling. It is well known to all tin-miners, that the smelters used to deduct from the produce of any black tin for sale, from 1 to 3 cwts., according to quality, to pay smelting charges and waste; and that they now deduct 1½ cwt., and allow such a price for the tin as they consider they can afford to meet the same, and that this, in effect to the miner, is the same. The facts are, as the following calculations from actual experiments will show, that the miner, from not bringing his tin to a high produce, gets only £46 per ton for pure white tin, after smelting charges are deducted,

for a produce 32¾ per cent.; while, under the same circumstances, as regards standard, he gets £74. 10s. per ton, when the produce is 56¾. I am quite aware, as a lead-smelter, that there will be a difference in the calculation, according to the nature of the impurity of the ore, from the character of the metalliferous portion rendering the refined metal of less value in the market; but argue, that even with the most injurious it does not bear any proportion in this case, as compared with the different prices obtained for such refined metal in the market, or can in any way account for the difference of price obtained for the black tin from loss or otherwise, and refining, provided the process of smelting is conducted upon proper principles, according to the character of the impurities in the black tin for sale; at the same time, under existing circumstances, as regards the interest of the miner, I wish to show the necessity of bringing his black tin to a high produce, so as to leave no excuse for his not getting full value for it, even at a loss in dressing cost, and comparative quantity and value.

The results shown are from five trials of different qualities :—

	Produce, after deducting 1¼ cwt. for smelting charges.	Price given by smelters per ton of black tin.	Price per ton received by miners for white tin, free of smelting charge.
No. 1	56¾	£42 5 0	£74 10 0
2	41¾	27 10 0	65 12 0
3	32¾	15 0 0	46 0 0
4	47¾	32 15 0	68 12 0
5	35¾	18 10 0	51 16 0

ON GOLD DEPOSITS AND WASHINGS.

BY JOSÉ E. CLIFFE, M.D., F.G.S.

Gold, from being found in its metallic state, is always, even to those acquainted with finding it in its deposits, a subject of much exaggeration, to many times its real amount; and even to the well-informed, the mind willingly deceives itself as to the real quantity, and no approximations are admitted to be correct, except the real one of its actual weight.

Brazil, Mexico, some parts of North America, Borneo, and other places, have had their day; their riches were, for a time, equal to what California *may* produce; but the very different circumstances which existed in those countries when gold was discovered, prevented, from their little intercourse with the civilized world, the fame of their wealth preceding the actual produce of it being brought to market. Africa is known to contain great diluvial deposits of gold, and probably also rich veins, but its pestiferous climate has hitherto prevented the

splendacious descendants of the Anglo-Saxon race from working, and proving this fact; yet the gold received from Africa annually amounts to nearly $1\frac{3}{4}$ tons by weight, and this under the disadvantageous mode of solitary workings, in a climate where Nature supplies man's wants, and they are but few, and gold is produced as wanted for extraneous luxuries; and this by a people so well known, as the African race now are, to abominate continuous labour.

Gold will be found here (California) in the four following conditions, that seem to identify it in all other countries. Gold and platina, not being oxidable in Nature's laboratory (the earth), are exceptions to the other metals, whose ores exist under circumstances that have no bearing to gold, stream tin excepted.

1st. The *diluvial deposits* are found in the beds of streams and valleys, and occasionally, where obstructions have occurred, to a limited height on the higher lands in the neighbourhood of rivers, embedded in gravel and the debris of rocks, and continuous as regards the quality of the gold, and frequently as regards the given contents per cubic fathom. These, in most cases, from the greater facility of working, have been the most productive, and have more frequently enriched the miner, as little machinery is requisite, and the simple materials required for forming an establishment are easily procured, and the returns are also quick; and, everything being required for temporary purposes, are cheaply moved as the gold becomes exhausted.

2nd. Veins and beds, which are generally found to exist in mountains of secondary height, but parallel to the great meridional range of the continent, the working of these requires machinery of various kinds—pumps, stamps, large amounts of iron, powder, &c.; in fact, they are intended to be permanent establishments, and require a certain outlay before the expected profits can arise; yet, at the same time, if rich, they are generally of a very temporary nature, as a few years' continued labour exhausts the productive parts of the veins, and it is now well known, in the majority of gold veins, that, at very moderate depths, the gold gradually and regularly diminishes in quantity; in some cases it improves slightly in quality, yet, at last, the gold produced is much too dear for the market prices. The history of old gold-mines does not prove the veins are entirely exhausted, only that the gold exists in such small quantities per cubic fathom of the gangue, that a graduated increasing loss arises upon each ounce of gold produced, from the increased expense of going deeper.

3rd. Gold is also found overlaying the diluvial deposits in the recent earthy matter, and is slowly and gradually brought into the valleys and streams by the action of rain, torrents of water, &c.: in the neighbourhood of lodes and beds (auriferous)

they frequently are very rich, and in many cases have led to the discoveries of important mines, as the once far-famed Gongo Soco, of Brazil. Frequently, however, this gold is the mere concentration of many ages, by the action of water on earthy and ferruginous soils, which, for hundreds of miles contain traces of gold throughout, but so small a per-centage per ton, that by no known process of extraction can it be made available for industrial purposes. Some of the states of North America, Mexico, Vaxaca, and Brazil are so situated; the object in these countries not being to find where gold exists, but where gold exists in quantities sufficient to repay the labour expended in bringing it into a saleable condition, with a present or prospective hope of bunches.

4th. The last gold which is usually found is a portion which exists in worked diluvial and alluvial deposits, but, from imperfections in working or washing, a portion escapes, and, from its specific gravity, it soon settles in the earthy contents of the workings and the rivers, and as the earthy matter is annually washing away, whilst most of the gold remains, after a lapse of time, it is frequently found to be more or less profitable to a hardworking class, whose labour is the last vestige of the golden dream of the once famed El Dorado.

It is much to be regretted that, in this age of machinery, nothing of consequence has been done for the gold-finder in facilitating the separation of gold from earthy matter with less loss than is now generally known; the various amalgamating apparatus are too tedious for poor ores, and unnecessary for rich ones; yet, from the well-known simple affinity of mercury with gold, and its readiness of action, we trust something will be done, as earthy matter containing from 10 to 200 grains of gold, by weight, per ton of earth, unless water is abundant, will frequently not pay for washing, and the loss more than is generally supposed. A ton of earth contains, by weight, more than fourteen millions of grains; and to gather together any two pennyweights of gold out of this quantity, and a part of it in an impalpable powder, it requires no stretch of the imagination to suppose some is swept away by the action of water, and the small stones, mud, and clay.

A great mistake frequently exists in gold districts upon finding a rich spot; the whole area of the country is at once supposed to be equally rich; of course time soon shows the fallacy of this belief.

It has been generally found that, at a distance from the mountains in which the auriferous streams arise, there is a point in which the gold is nearly an impalpable dust; that, going up the stream, it sensibly increases, in laminated particles, and increases gradually in coarseness, till the gold is found with its natural roughness and points, as if fresh broken from its

matrix. Larger pieces occur, even to many pounds in weight; as also pieces are found containing portions of the matrix, thus occasionally enabling the shrewd observer to form a good guess of the neighbourhood in which to look for mines with some hopes of success.

Few, comparatively speaking, have enriched themselves by goldfinding: the very circumstance of finding money excites to extravagance, and from this cause many through whose hands much wealth has passed, have left off poor as when they commenced.

The aupreous streams of Wicklow are in strict accordance with these remarks.

ON ACCIDENTS IN MINES.*

BY THE EDITOR.

THE fearful loss of life recorded in the columns of the diurnal and weekly press has at last aroused the sympathies of the legislature, and it is to be hoped that the day is near at hand when the collier and miner will receive that protection to which they are admitted to be so justly entitled. The legislative body in its wisdom has thought fit to interfere with the mining interest by the introduction of foreign ores duty free, and there is no doubt but that coal would be imported, instead of being exported, were we not too secure as regards our supply and demand, both at home and abroad. Lord Ashley, it will be remembered, introduced a bill into the House of Commons, which is now the law of the land, whereby females and children under twelve years of age are precluded from working underground, such being a common practice, more especially in the north; and it was then hoped that the noble lord would follow up the good work he had begun, by introducing some measure having for its object the greater security of the life of the miner and collier, and making a provision for the widows and orphans of those whose lives might be sacrificed in their daily labour. Then it was that much exertion was used to direct the attention of Government and the legislature to this important subject—petitions were presented, public meetings were held in Cornwall and Devon, many promises were made of support, and even certain members of the corporation of the city of London kindly interested themselves in the advocacy of a measure which, from the sad results of the past few weeks, has only now been forced upon the attention of the Government. It

* The following are abbreviations of the terms employed in the several tables accompanying the present paper:—Exp. Explosion of Fire Damp or Carbonic Gas. F.R. Fall of Rock or Coal. Co. Colliery. F.S. Fall in Shaft or Pit. I.W. Iron Works. A.S. Accident in Shaft or Pit. Ma. Machinery. M. Mine. Ac. Accident. Qu. Quarry.

is to be regretted that public sympathy and the public voice were silent to the appeal thus made to the kindlier feelings of humanity, a want of co-operation having alone been the cause of failure. The state of the working miner and collier has oft been noticed, and their rights advocated, however feebly, by the writer of the present article, and every step taken by personal interviews and written correspondence to effect the much-desired object, but without avail. The present appears a fitting time to renew the appeal to humanity and to those who, seated at the warm hearth, are unconscious, and in some instances, we fear, regardless, of the toils and dangers attendant on the vocation of the working miner and collier. Immured from eight to ten hours in the bowels of the earth, with a dim light, exposed to fatigue and danger, he dares not remonstrate or complain lest he should lose his little earnings—little as compared with the risk incurred and the injury of health sustained. The comparatively short duration of life of the miner and collier has been frequently the subject of papers read at various meetings, but with no other result than thanks being conveyed to the lecturer or contributor. It is true that in Cornwall a step has been taken whereby the position of the miner is in a great degree ameliorated by the introduction of the machine for raising and lowering miners, whereby accidents are avoided and much fatigue spared; for it is to be considered that in a mine of 300 fathoms depth there are no less than 3,600 steps to be taken in descending and ascending by means of a ladder, which at Tresavean and one other mine is now remedied. This mode of climbing is principally confined to the mineral lodes, as in the north, in Staffordshire, and all colliery districts, the collier is let down by means of the whim, or engine, and is thus saved any manual exertion, the only drawback being the possibility of the machinery or gear getting out of order, or the breakage of the rope, which we lament to say are cases of too frequent occurrence. The prejudice on the part of the Cornish miner to trust himself to a rope is universal throughout the mining districts, while on the other hand, the collier of the north smiles at the timidity displayed by the Cornish miner.

It is, however, to the frequent and more fatal occurrences of loss of life from explosions of fire-damp that we would wish to direct and rivet public attention. We have, with some care, drawn out a statement of the several accidents recorded in the columns of the *Mining Journal* during the past year; and when it is considered that this sad record forms but a small portion of the lives sacrificed annually, we think it requires no argumentative power or reasoning to convince the most sceptical of the necessity of parliamentary interference. That there are difficulties to contend with, and that there is naturally a feeling of jealousy manifested by the coal-owners, who do not think it proper that private property shall be interfered with, no doubt can for a

moment exist, and it is the peculiar delicacy with which the subject can be approached which renders it one of the most sensitive for legislative enactment. We can very well conceive the impracticability of legislating on a question like the present in a way which shall give general satisfaction, or, indeed, be perfect. The appointment of government officers, without especial care being observed in framing a code of rules or regulations, is one which is well calculated to excite a degree of uneasiness on the part of the mine and colliery proprietor; but it appears to us, that if a committee were appointed to take the evidence of practical men, much of the difficulty which presents itself would be overcome; and although it might be required at a future period to amend the act, yet any approximation towards the establishment of a perfect supervision of the working of mines and collieries is much to be desired. To effect this, we consider that the agents to be appointed should be resident practical coal-viewers or mining agents, that a competent engineer should also be selected, whose powers should be exercised over one district, and that in no instance should a viewer from the north of England be placed as a supervisor of a district in South Wales, any more than that one from the midland counties should proceed to the north: each district has its own system, and which is peculiar in itself from local causes; hence the necessity of appointing parties who are acquainted with the modes of working adopted, and the features which the colliery or mine presents. It should be the duty of the engineer at least once a month to inspect the engines, ropes, gear, &c. The viewer, or mine-captain, should be bound to send in a report to the Museum of Practical Geology, to be placed with mining records, and it should be compulsory on all colliery and mine owners to render, from time to time, sections and plans of the workings. A book should also be kept at the counting-house of the mine, in which should be registered all accidents, and a monthly report made thereof; and further, that in all cases where an explosion has taken place, or that the existence of fire-damp is proved, it should in like manner be compulsory on the proprietors to take the necessary precautions by the use of the safety-lamp, and observing that there is a free current of air passing through the colliery by the erection of furnaces or sinking the necessary pits, with effective doorways and channels, for the admission and emission of air.

We will, however, at once proceed to give the tables from whence our deductions are drawn, merely premising that they can be considered only as a small proportion of the fatal accidents which occur, and which we lament to say are of daily occurrence.

The number of accidents during the past year, and which are embodied in the following tables, are made up from the columns of the *Mining Journal*, and will be found to be 403, the loss of life 567, of which 256 are from explosion of fire-damp, and those

sustaining injury from the same cause 130, making together nearly one-half of the number.

1848.	DEATHS.						INJURIES.					
	Ex.	F. R.	F.S.	Ma.	Ac.	Total.	Ex.	F.R.	F.S.	Ma.	Ac.	Total.
January..	12	18	16	7	..	53	14	3	3	1	8	29
February	36	21	15	17	..	89	18	3	2	4	..	27
March ..	16	17	7	5	..	45	3	6	2	2	2	15
April	51	15	12	3	2	83	17	6	2	..	1	26
May	5	11	2	4	1	23	6	2	..	..	..	8
June	22	11	2	2	2	39	6	..	..	5	1	12
July	..	5	4	4	3	16	10	4	1	..	2	17
August ..	47	13	1	2	6	69	12	4	..	1	..	17
September	12	9	4	7	..	32	6	3	2	..	..	11
October..	10	8	3	4	3	28	11	2	..	3	..	16
November	34	15	4	..	3	56	1	5	1	2	..	9
December	11	20	..	..	3	34	26	17	..	..	9	52
Total ..	256	163	70	55	23	567	130	55	13	18	23	239

The following are the monthly returns, to which we have prefixed those for the preceding year.

	1847.				1848.			
	Accid.	Deaths	Injur.	Total.	Accid.	Deaths	Injur.	Total.
January	44	92	15	107	43	53	29	82
February	34	56	15	71	44	89	27	116
March	49	31	12	43	32	45	15	60
April.....	22	48	15	63	40	83	26	109
May	40	40	8	48	23	23	8	31
June.....	50	44	13	57	39	39	12	51
July	37	80	15	95	21	16	17	33
August.....	38	46	25	71	32	69	17	86
September	51	26	19	45	31	32	11	43
October	60	60	40	100	26	28	16	44
November	39	57	5	62	31	56	9	65
December	24	42	14	56	41	34	52	86
Total ..	488	623	196	819	403	567	239	806

Although there is but little to add in the way of statistics beyond the returns thus given, it may be well to examine into the causes to which this fearful loss of life is to be attributed, so that it may be seen whether some remedy may not be applied by care being enforced in the cases of fiery collieries, or where the air is known to be bad, and the strict observance of the use of proper machinery: all this the labourer has a right to expect from his employer, and the Government to impose for the security of the lives of those employed.

Date. 1848.	No. of Accidents.	DEATHS.						INJURIES.						TOTALS.	
		Exp.	F.R.	F.S.	Ma.	Ac.not specif.	Total.	Exp.	F.R.	F.S.	Ma.	Ac.not specif.	Total.	Dth. & Injurs.	Monthly
Jan. 1	11	3	5	5	..	..	13	..	1	..	..	..	1	14	
8	4	..	1	1	1	..	3	..	..	1	..	..	1	4	
15	8	..	3	3	2	..	8	..	..	2	..	..	2	10	
22	12	4	6	3	2	..	15	..	1	..	..	8	9	24	
29	8	5	3	4	2	..	14	14	1	..	1	..	16	30	82
Feb. 5	12	1	6	4	5	..	16	..	1	..	2	..	3	19	
12	14	18	5	8	..	..	31	16	1	1	..	..	18	49	
19	9	8	4	1	12	..	25	2	1	1	2	..	6	31	
26	9	9	6	2	..	..	17	..	..	..	..	..	..	17	116
Mar. 4	6	..	2	2	5	..	9	..	..	..	2	..	2	11	
11	16	12	9	5	..	..	26	..	..	2	..	1	3	29	
18	7	1	5	..	..	..	6	..	6	..	..	1	7	13	
25	3	3	1	..	..	..	4	3	..	..	..	..	3	7	60
April 1	15	21	7	9	1	1	39	3	2	..	..	..	5	44	
8	9	22	1	2	..	..	25	7	1	2	..	..	10	35	
15	6	..	2	1	1	..	4	6	3	..	..	1	10	14	
22	7	1	4	..	1	1	7	..	..	..	..	..	..	7	
29	3	7	1	..	..	..	8	1	..	..	..	..	1	9	109
May 6	8	2	5	1	1	..	9	..	..	..	..	..	..	9	
13	3	..	4	..	..	..	4	..	1	..	..	..	1	5	
20	4	3	1	1	..	..	5	6	..	..	..	..	6	11	
27	5	..	1	..	3	1	5	..	1	..	..	..	1	6	31
June 3	15	5	5	2	2	..	14	6	..	..	2	..	8	22	
10	2	10	..	..	..	..	10	..	..	..	1	..	1	11	
17	7	..	5	..	..	2	7	..	..	..	2	1	3	10	
24	2	7	1	..	..	..	8	..	..	..	..	..	..	8	51
July 1	2	..	1	2	..	..	3	..	..	1	..	..	1	4	
8	4	..	..	1	2	..	3	7	..	..	..	..	7	10	
15	3	..	2	..	..	1	3	..	4	..	..	..	4	7	
22	9	..	2	1	1	2	6	2	..	..	..	..	2	8	
29	3	..	..	..	1	..	1	1	..	..	..	2	3	4	33
Aug. 5	8	14	3	..	..	2	19	5	..	..	..	..	5	24	
12	12	13	6	1	..	..	20	1	3	..	..	..	4	24	
19	6	15	2	..	1	..	18	2	1	..	1	..	4	22	
26	6	5	2	..	1	4	12	4	..	..	..	..	4	16	86
Sept. 2	9	6	2	1	3	..	12	6	1	..	..	..	7	19	
9	3	..	..	1	1	..	2	..	..	1	..	..	1	3	
16	6	2	2	1	1	..	6	..	1	..	..	..	1	7	
23	9	1	3	..	2	..	6	..	..	1	..	..	1	7	
30	4	3	2	1	..	..	6	..	1	..	..	..	1	7	43
Oct. 7	10	1	2	2	2	3	10	6	1	..	..	..	7	17	
14	6	2	3	..	..	..	5	5	1	..	2	..	8	13	
21	4	1	1	..	2	..	4	..	..	..	..	..	..	4	
28	6	6	2	1	..	..	9	..	..	..	1	..	1	10	44
Nov. 4	9	30	2	3	..	2	37	1	..	1	..	..	2	39	
11	6	..	5	..	..	..	5	..	3	..	1	..	4	9	
18	5	..	3	1	..	..	4	..	..	..	1	..	1	5	
25	11	4	5	..	..	1	10	..	2	..	..	..	2	12	65
Dec. 2	11	5	7	..	..	2	14	5	4	..	..	..	9	23	
9	5	..	2	..	..	..	2	8	..	..	..	2	10	12	
16	8	1	2	..	..	1	4	1	4	..	..	1	6	10	
23	8	1	1	..	..	..	2	..	7	..	..	3	10	12	
30	9	4	8	..	..	..	12	12	2	..	..	3	17	29	86
Totals	403	256	163	70	55	23	567	130	55	13	18	23	239	806	806

The following table gives the various localities, and causes of accident.

Date.	Name of Mine.	Killed.	Injured.	Cause.
1848.				
Jan. 1	Dowlais Iron Works	3	..	Exp.
	Penywann	1	..	F.R.
	Pontypool	..	1	F.R.
	Flowery Field Co. ..	1	..	F.R.
	Hurst Knowl Co. ..	1	..	F.S.
	Knutton	1	..	F.S.
	Blaina Colliery ..	1	..	F.R.
	Rowley Regis ..	1	..	F.R.
	Botley Colliery ..	1	..	F.R.
	Billinge Higher End	2	..	F.S.
	Scowcroft Colliery ..	1	..	F.S.
8	Dudley	..	1	F.S.
	Tipton	1	..	Ma.
	Chesterfield	1	..	F.R.
	Dolcoath Mine ..	1	..	F.S.
15	Devon Consols Mine	1	..	F.S.
	Arbour House Co. ..	1	..	Ma.
	Cwn Celyn	1	2	F.S.
	Tipton	1	..	F.R.
	Bilston	1	..	F.R.
	Clay Cross Colliery ..	1	..	Ma.
	Ripley Colliery ..	1	..	F.R.
	Holywell Colliery ..	1	..	F.S.
22	Kingswinford Co. ..	3	..	Exp.
	East Rainton Co. ..	1	..	Ma.
	Consols Mine ..	1	..	F.R.
	Byer's Green Co. ..	1	..	F.S.
	Spath Colliery ..	2	..	F.S.
	Cappen Field Co. ..	1	..	Ma.
	St. Helen's Colliery	1	1	F.R.
	St. Denis Iron Works	..	8	Ac.
	Alfreton	1	..	F.R.
	Tupton Colliery ..	1	..	Exp.
	Dudley Colliery ..	2	..	F.R.
	Dudley Wood ..	1	..	F.R.
29	Tiviot Dale Colliery..	2	..	F.R.
	Wigan	1	1	F.R.
	Tincroft Mine ..	1	..	F.S.
	Thorncliffe Colliery..	1	..	Exp.
	Stuckley Colliery ..	3	13	Exp.
	Donnington Colliery	1	1	Exp.
	Brymbo Colliery ..	2	1	Ma.
	Laffalk Colliery ..	3	..	F.S.
Feb. 5	Blower's Green Co...	1	..	F.R.
	Rose Bridge Colliery	2	..	F.R.
	Cwmavon Iron Works	1	..	F.S.
	Penydurran	4	2	Ma.
	Bull Pluck Coal Pit..	1	..	F.S.
	Wheal Tremayne ..	1	..	Ma.
	West Bromwich ..	2	..	F.R.
	Wirksworth	1	..	F.S.
	Hady Ironstone Pits	1	..	F.R.
	Brampton	..	1	F.R.
	Tipton	1	..	Exp.
	Staveley Iron Works	1	..	F.S.
12	Heathfield Colliery ..	15	16	Exp.
	Wheal Franco Mine	1	..	F.S.

Date.	Name of Mine.	Killed.	Injured.	Cause.
1849.				
	Patricroft Colliery ..	..	1	F.S.
	Millsfield Colliery ..	1	..	F.S.
	Buckley Colliery ..	2	..	F.R.
	Ditto	1	..	Exp.
	White Lee Colliery ..	1	..	F.S.
	Walsall Colliery ..	1	1	F.R.
	Wednesbury Colliery	2	..	Exp.
	Somercote's Colliery	1	..	F.R.
	Staveley Colliery ..	3	..	F.S.
	Burnley, nr Blackburn	1	..	F.S.
	Newfield Colliery ..	1	..	F.S.
Feb 19	Ditto	1	..	F.R.
	Brierley Hill ..	1	..	F.S.
	Maesteg Iron Works	1	..	F.R.
	Pontypool	..	1	F.S.
	Aberdare Colliery ..	1	1	F.R.
	Old Park Co., Dudley	1	..	F.R.
	St. Helen's	7	2	Exp.
	New Field Co., Wolv.	1	..	Exp.
	Pyle, Glamorganshire	1	..	F.R.
	Manchester	12	2	Ma.
26	Wheal Reeth ..	1	..	Exp.
	Workworth	1	..	F.R.
	Bilston	1	..	Exp.
	Brierley Wood ..	1	..	F.R.
	Woodsfield Colliery..	1	..	F.R.
	Victoria Pit	7	..	Exp.
	West Bromwich ..	1	..	F.S.
	Tividale	1	..	F.R.
	Bunn's Lane Co. ..	1	..	F.R.
	Old Park Colliery ..	1	..	F.S.
Mar. 4	East Cramlington Co.	1	..	Ma.
	Blue Pitt's	4	2	Ma.
	Neath	1	..	F.R.
	Merthyr	1	..	F.R.
	Dudley Port Co. ..	1	..	F.S.
	Old Buffery Iron W.	1	..	F.S.
11	Great Polgooth Mine	1	..	F.S.
	United Mines ..	1	..	F.S.
	S. Wheal Francis M.	1	..	F.S.
	Balleswidden Mine ..	2	..	F.R.
	Levant Mine	..	2	F.S.
	Murton Pit	1	..	F.S.
	Ludworth Colliery ..	1	..	F.R.
	Blaina..	1	..	F.R.
	Pontypool	1	..	F.R.
	Benton Quarry ..	8	..	Exp.
	Hall Park Colliery ..	1	..	F.S.
	Graveland Colliery ..	1	..	F.R.
	Balleswidden.. ..	2	..	F.R.
	Bunn's Lane ..	1	..	F.R.
	Monkland Iron Works	4	..	Exp.
	Haswell Colliery ..	1	..	Ac.
18	New Earth Colliery..	1	..	Exp.
	Sholvesmore Co. ..	1	..	F.R.
	Rowley Regis ..	1	..	F.R.
	Pit House Colliery ..	1	..	Ac.

Date.	Name of Mine.	Killed.	Injured.	Cause.
1848.				
	Thornley	1	..	F.R.
	Waldridge Colliery ..	1	..	F.R.
	Benton Quarry ..	1	0	F.R.
Mar25	Lady Shore Colliery	1	1	Exp.
	St. Katherine's ..	1	..	F.R.
	Whitwell Colliery ..	2	2	Exp.
April 1	Eaglesbush Colliery	19	..	Exp.
	Cwmavon	1	..	Ma.
	Dawley	0	..	F.S.
	East Wheal Rose M.	1	1	F.R.
	Creegbraws Mine ..	1	..	F.R.
	Biggamain Colliery ..	1	..	F.R.
	Bilston	1	..	F.R.
	Kingswinford ..	1	..	F.R.
	Nagersfield Colliery..	1	..	F.R.
	Parkafield Colliery ..	1	..	F.S.
	Lynvi Mine	1	..	Exp.
	Kidwelly Colliery ..	1	3	Exp.
	Eckington Colliery ..	1	..	F.R.
	Martinlowe Colliery ..	..	1	F.R.
	Sherborne Hill Co. ..	1	..	Ac.
8	Cardiff	1	2	Exp.
	Davies's Colliery ..	1	3	Exp.
	Dowlais Pit	1	..	F.S.
	Hart's Hill Colliery..	..	1	F.R.
	Hay Green Colliery..	..	2	F.S.
	Yew Tree Colliery ..	1	..	F.R.
	Merthyr Colliery ..	1	..	F.S.
	Swansea Colliery ..	..	3	Exp.
	Eskyns Co., Neath ..	20	..	Exp.
15	Manchester	1	..	F.S.
	Whitehaven	1	.	F.R.
	Wolverhampton ..	1	3	F.R.
	Southerland Colliery	..	1	Ac.
	Shipley Colliery ..	1	..	Ma.
	Pwllfaron Colliery ..	..	0	Exp.
22	Dudley	1	..	F.R.
	Cradley	1	..	Exp.
	Wheal Maria ..	1	..	Ac.
	Dudley	1	..	Ma.
	Sedgeley	1	..	F.R.
	Cappon Field Colliery	1	..	F.R.
	Kingswinford ..	1	..	F.R.
29	Victoria Iron Works	0	1	Exp.
	Dudley	1	..	F.R.
	West Bromwich ..	1	..	Exp.
May 6	W. Wheal Jewel M.	1	..	F.R.
	United Mines ..	1	..	F.S.
	Rowley Regis ..	2	..	F.R.
	Dudley	1	..	F.R.
	Merthyr	1	..	Exp.
	Cyfarthfa	1	..	F.R.
	Dancing Cairne Qu.	1	..	Exp.
	Loawe Colliery ..	1	..	Ma.
13	Bunn's Lane Co. ..	..	1	F.R.
	Rowley Regis ..	2	..	F.R.
	Merthyr	2	..	F.R.
20	Risca	2	5	Exp.
	Clay Cross	1	1	Exp.
	Highfield Colliery ..	1	..	F.S.
	Sedgeley Colliery ..	1	..	F.R.

Date.	Name of Mine.	Killed.	Injured.	Cause.
1848.				
May27	United Mines ..	1	1	F.R.
	Wheal Owles Mine	1	..	F.S.
	Brierley Hill Colliery	1	..	Ac.
	Ditto Works ..	1	..	Ma.
	Dowlais	2	..	Ma.
June 3	Goginan Mine ..	2	..	Exp.
	Hales Owen Co. ..	1	..	F.R.
	Brierley Hill	..	11	Ma.
	Darlaston	1	..	F.R.
	Heath Colliery ..	1	..	Exp.
	Greet's Green Co. ..	1	..	F.R.
	Addenbrooke Co. ..	1	..	F.R.
	Cwm Ammon ..	1	..	Ma.
	Mabe Mine	1	2	Exp.
	Alfred Consols Mine .	1	..	F.S.
	Ansell's Colliery ..	1	..	Ma.
	Old Park Colliery ..	1	..	F.S.
	Willenhall	1	..	F.R.
	Lockaford	1	4	Exp.
	Beacon Hill Colliery	..	1	Ma.
10	Kirkby Treleth ..	..	1	Ma.
	Hart's Hill	10	..	Exp.
17	Barbers fieldC., Bilstn	1	..	F.R.
	Bilston	2	..	Ac.
	Carthen Mine	..	1	Ac.
	Tividale Colliery ..	2	..	F.R.
	Rowley Regis ..	1	..	F.R.
	Hateley Heath ..	1	..	F.R.
	Wakefield	..	2	Ma.
24	Preston	7	..	Exp.
	Cyfathfa	1	..	F.R.
July 1	Newcastle on Tyne ..	2	1	F.S.
	Middleton	1	..	F.R.
8	Ince Hall Colliery ..	2	..	Ma.
	Consols Mine ..	1	..	F.S.
	Wednesbury	..	0	Exp.
	Cooks Kitchen Mine ..	..	1	Exp.
15	Rowley Regis ..	1	..	F.R.
	Tividale Hall Colliery	1	4	F.R.
	Dalmarnock	1	..	Ac.
22	New Kelloe	1	..	Ac.
	Murton Colliery ..	1	..	Ac.
	Kingswinford ..	1	..	F.R.
	St. Just	1	..	Ma.
	Boscaswell Downs M.	1	..	F.S.
	Rowley	..	1	Exp.
	Dudley	..	3	F.S.
	Bilston	1	..	F.R.
	Stray Park Mine ..	..	1	Exp.
29	Rowley Regis ..	..	1	Exp.
	Kingswinford ..	1	..	Ma.
	Tondu I. W., Brdgend	..	2	Ac.
Aug. 5	Seaton Colliery ..	2	..	Ac.
	Deslington I. W. ..	4	..	Exp.
	Preston	7	5	Exp.
	Aberdare	1	..	Exp.
	Hart's Hill Colliery	1	..	F.R.
	Bunker's Hill Colliery	1	..	F.R.
	Parkfield Colliery ..	1	..	F.R.
	Faversham	2	..	Exp.
12	Kingswinford ..	12	..	Exp.

Date.	Name of Mine.	Killed.	Injured.	Cause.
1848.				
Aug 12	Norton	2	..	F.R.
	Tipton	1	..	Exp.
	West Bromwich ..	1	..	F.R.
	Bartlay Hills Colliery	1	..	F.S.
	Wednesbury Oak Co. ..	..	1	F.R.
	Gannow Colliery	..	1	F.R.
	Dudley	..	1	Exp.
	Dudley	..	1	F.R.
	Wednesbury	1	..	F.R.
	Holly Hall Colliery ..	1	..	F.R.
	Treleigh Consols M.	1	..	F.R.
19	PolkaColliery, Murton	15	2	Exp.
	Old Park Colliery ..	1	..	F.R.
	Street End Colliery ..	..	1	F.R.
	Stourbridge	..	1	Ma.
	Tividale Colliery ..	1	..	F.R.
	Delabole Quarry ..	1	..	Ma.
26	Patricroft Colliery ..	4	..	Ac.
	Dudley	2	..	Exp.
	Thornley Colliery ..	1	..	Ma.
	Burslem	1	4	Exp.
	Dudley	1	..	F.R.
	Pontypool	2	..	Exp.
	Risca	1	..	F.R.
Sept. 2	Beam Mine	1	1	Exp.
	Hindley Green Co. ..	5	5	Exp.
	Merthyr	1	..	F.R.
	W. Cramlington Co.	1	..	F.R.
	Park end	..	1	Ac.
	Rowley Regis ..	..	1	F.R.
	Brooch Colliery ..	2	..	Ma.
	Old Park Colliery ..	1	..	F.S.
	Bilston	1	..	Ma.
9	Great Lumley ..	1	..	Ma.
	Coneygreaves I. W.	1	..	Ac.
	Shettleston, N.B. ..	..	1	F.S.
16	Duckenfield	2	..	Exp.
	Sheffield Colliery ..	1	..	F.S.
	Tividale	1	..	F.R.
	Sedgley	1	..	F.R.
	Wednesbury	..	1	F.R.
	Delabole Slate Quarry	1	..	Ma.
23	Strangeway's Colliery	1	..	Ma.
	Cowpen Colliery ..	1	..	F.R.
	Camlington	1	..	Ac.
	Burnley	1	..	Ma.
	Tividale	1	..	F.R.
	Wolverhampton ..	1	..	F.R.
	Stow Heath Colliery ..	..	1	F.S.
	Boswell Colliery ..	..	..	Exp.
	Wanlockhead Mine ..	1	..	Exp.
30	Cowpen Colliery ..	1	..	F.R.
	Whitehaven	1	1	F.S.
	Merthyr	1	..	F.R.
	Little Green Coal Pit	3	..	Exp.
Oct. 7	Damhead Colliery ..	1	..	Ac.
	Dalzell Colliery ..	1	5	Exp.
	Shutt End	1	..	Ac.
	Gyrnos Quarry ..	1	1	F.R.
	Vineyard Down Q. ..	1	..	F.R.
	Rowley Regis ..	1	..	Ma.

Date.	Name of Mine.	Killed.	Injured.	Cause.
1848.				
	Eagle Colliery	..	1	Exp.
	Monkton Coombe ..	1	..	Ma.
	Merthyr	1	..	Ac.
	Bilston	2	..	F.S.
Oct. 14	Middleton	1	1	Exp.
	Tamworth	..	4	Exp.
	Brettell Lane ..	..	2	Ma.
	Hart's Hill	..	1	F.R.
	Netherton	3	..	F.R.
	Eagle Colliery ..	1	..	Exp.
21	Middleton	1	..	Exp.
	Brierley Hill	1	..	Ma.
	Swansea	1	..	Ma.
	Priors Lee Works ..	1	1	F.R.
28	Wheal Trumpet M. ..	1	..	F.S.
	Tywarnhale Mine ..	1	..	Exp.
	Brierley Hill	..	1	Ma.
	Sennela Green ..	5	..	Exp.
	Clay Cross Colliery ..	1	..	F.R.
	Dudley	1	..	F.R.
Nov. 4	Walsall	1	..	F.R.
	Brierley Hill	1	..	F.R.
	Tipton	..	1	F.S.
	Bank Colliery ..	1	..	F.S.
	Coseley	2	..	Ac.
	Rowley	..	1	Exp.
	Wynie Hill Colliery	30	..	Exp.
	Brockmoor Green ..	1	..	F.S.
	Bilston	1	..	F.S.
11	Carn Brea Mine ..	1	..	F.R.
	Merthyr	1	..	F.R.
	Tividale	2	1	F.R.
	Llynvi Works	..	2	F.R.
	Tresavean Mine ..	..	1	Ma.
	Risca Colliery ..	1	..	F.R.
18	Wednesbury	1	..	F.R.
	Bilston	1	..	F.S.
	Dudley	1	..	F.R.
	Londonderry Colliery	1	..	F.R.
	Blackdale Mine ..	.	1	Ma.
25	Charlestown U. M. ..	..	2	Exp.
	Great Rough Tor M.	1	..	F.R.
	Delabole Quarry ..	1	..	Ac.
	Wheal Ann	1	..	Exp.
	Rowley Regis ..	..	1	F.R.
	Brierley Hill	1	..	F.R.
	Wolverhampton ..	2	..	Exp.
	Dudley	..	1	F.R.
	Coseley	1	..	F.R.
	Wednesbury	1	..	Exp.
	Llansamlet	2	..	F.R.
Dec. 2	Drake Walls Mine ..	1	..	Ac.
	West Auckland ..	1	..	Ac.
	Bryndu Colliery ..	..	2	Exp.
	Swansea	2	..	F.R.
	West Bromwich ..	1	..	F.R.
	Wolverhampton ..	1	..	F.R.
	Dudley	2	2	F.R.
	Bilston	1	1	Exp.
	Oakerthorpe	1	1	F.R.
	Wigan	2	4	Exp.

Date.	Name of Mine.	Killed.	Injured.	Cause.	Date.	Name of Mine.	Killed.	Injured.	Cause.
1848.					1848.				
	Sedgley	1	..	F.R.		Dudley Port	1	..	F.R.
Dec. 9	Walsall	3	..	F.R.		Middleton Quarry ..	..	2	Ac.
	Bridgend	..	3	Exp.		Chambers's Colliery	1	..	Exp.
	Cefn Cwse Iron W...	..	2	F.R.		Wren's nest Hill Qu.	..	1	F.R.
	Tividale	..	1	Ac.		Eagle Quarry ..	..	1	F.R.
	Corngreaves	..	1	Ac.		Dudley	..	4	F.R.
16	Newarthill Colliery ..	1	1	F.R.	Dec 30	Bentilee Colliery ..	6	..	F.R.
	Rowley Regis ..	..	1	Ac.		Trimdon Colliery ..	1	6	Exp.
	Tipton	..	2	F.R.		Washington Colliery	2	2	F.R.
	Owlacombe Mines ..	..	1	F.R.		Bilston	..	4	Exp.
	Carn Brea Mine ..	..	1	Exp.		Wolverhampton ..	1	..	Exp.
	Llanelly	1	..	Ac.		Dudley	..	2	Exp.
	Cefn Cwse Iron W...	1	..	F.R.		Shrubbery Works ..	..	1	Ac.
	PwllyraurLl'ngafel'ch	1	..	Exp.		Polladrass Downs M.	2	..	Exp.
23	Chem. Works, Neath	..	1	Ac.		Bryndu Colliery ..	..	2	Ac.
	Oldbury	..	1	F.R.					

Having thus given an analysis of the accidents reported, we have referred to those which have occurred during the first ten weeks of the year 1849, which we find amount to 138 deaths, or at the rate of 717 for the twelve months; and the injuries, many of which were fatal, but where death did not immediately ensue, were 57, or, in like manner, 296 per annum. It will be observed, that in the case of deaths it is an increase on the returns for 1848 of 27 per cent., thus affording additional evidence of the necessity of some prompt and decisive measure.

There is, however, another point connected with accidents in mines and collieries which we think well deserving of notice; it is that of provision being made for those who may be maimed or injured, and providing for the widows and orphans of those whose lives are sacrificed—we refer to a philanthropic fund, which we would have placed in the names of commissioners to be appointed by Government, and associated with the Museum of Practical Geology and Mining Records. A certain sum per 100 chaldrons or tons, however trifling, should be contributed by the coal-owners, and a comparatively insignificant amount subscribed by the working miner and collier; and were we to confine ourselves in a rough estimate to 1,500 collieries and mines, it will be at once seen that a contribution on the average of ten pounds from the owners of each would give an annual income of £15,000, to which add one penny per month from 150,000 miners and colliers, we should have, in addition, £7,500, which with local subscriptions would doubtless amount to a sum of £25,000 or £30,000 in the year; and thus, as it is to be hoped, in time form a large and increasing reserve fund, while provision would be made for the disabled and those who are deprived of their husbands and parents, and consequently their means of support. We doubt not but that if a fund of this nature were once instituted under the auspices of

Government, that the legislature would even sanction an annual grant, while we can well imagine that Royalty would be among the first of subscribers to its support; indeed, were an instance wanted as evidence of such sympathy being displayed, we have only to evidence the subscription of her Majesty the Queen and Prince Albert towards the fund for the relief of the families of those whose lives were lost at the late explosion in the Darley Main Colliery.

ON IRON IN THE FORM OF WIRE, AS A SUBSTITUTE FOR HEMP.

BY THE EDITOR.

IRON appears to have been known in the earliest period of the world's history, for we learn that as soon as men had provided food by tillage, clothing from the skins of animals, and had erected tents for their habitations, they began to search the earth for metals, and artificers rapidly appear in "brass and iron," and its use and value were well understood by the workers in metal. Its application to the manufacture of instruments of war, domestic use, and agriculture, followed successively as necessity required, and from a further acquaintance with its properties as a metal, and probably from an improved system of working it, it was applied to ornamental and decorative purposes; for which it appears to have become, at a very early era in the history of working in metals, extensively used and much esteemed—as the Babylonians and Sidonians acquired great fame, and excelled in the working of iron and other metals, and their application to ornamental and useful purposes.

The mode of working and fashioning iron, as practised in its earliest history, appears to have been rude in the extreme, and its character appears to have been invariably that of wrought or malleable iron. In all ages iron has been sought after and more highly prized than any other metal in the useful arts. As the arts and sciences progressed, and commerce sprang up, iron assumed an important position. Improvements in its treatment and working rendered it useful for new purposes, and new wants arose, and stimulated ingenuity to its application, and were so met. The treatment of iron by machinery, as in rolling, is of comparatively recent date, as also are the improvements in the first stages of the manufacture of that metal, which have introduced the present system of manufacturing bars, rods, and plates. This country, although the foremost amongst modern nations celebrated for iron manufactures and the application of

the mechanical arts, as well as for the production of quantity of the metal, has always had, and still has, rivals in the Swedes and Russians for the finer and better qualities of wrought iron. The manufacture of nails and such-like articles, created the want of rods of small size, and they appear in the first place to have been drawn down by hand-hammering on an anvil from a bar of a larger size. The Swedes and French, however, appear to have produced their rods, long prior to any similar plan in this country, by a process of splitting, having machinery for the purpose. The idea was borrowed from the Swedes, who kept their mode of effecting the object secret, and it is said that copies of their slitting-mills were obtained by a wandering fiddler who travelled from this country, and who introduced and ingratiated himself amongst the workmen, by his performances on his instrument, in the works for that purpose. Be this as it may, the same article was afterwards produced in this country which could not be produced before, and for which we had till then almost depended upon Sweden. The production of round rods, from the best description of iron manufacture by a perfect system of machinery, was followed by the requirement of still smaller and longer rods or wires; and the system of drawing through holes was adopted; when still further improvements in the first processes of manufacture to the form of bar iron were found necessary, so as to admit of the drawing process being carried on to a greater extent, to produce wire of smaller diameters of uniform quality, size, and tenacity throughout. Like all rising manufactures, that of producing metallic threads or wires has been continually improved upon, and formed the subject of many patents.

The various applications of iron wire alone are so numerous, that it is only necessary to divide the application of the larger sizes of wire to such purposes as fencing, netting, cinder-riddles, sieves, and such-like large purposes, and of the smaller sizes for birdcages, netting-needles, &c. &c., and the smaller sizes or gauges to the production of wire gauze for window-blinds, safety (miners') lamps, and other woven goods, and such similar purposes, the last of which requires the wire to be particularly fine both in size and quality, having to be woven in a loom in a similar manner to soft goods; for if the wire was not uniformly strong and good, it would not stand weaving; and the consequence of breakage is a serious matter in its use.

To fully describe and remark on the operations of drawing wire, would occupy too much space; and it will only therefore be necessary to state generally, that rods of iron are supplied from the mills to the wire-drawer: they are about $\frac{1}{4}$ in. diameter, and recent improvements have enabled the rod-maker to produce these rods in very long lengths singly; and the wire-drawer has succeeded in joining a number of these long rods together to

enable him to produce those very long lengths of wire, the want for which has been created within the last eight or ten years, for the manufacture of wire ropes, &c. The drawing of wire is conducted somewhat thus:—The rods are pointed and passed into the largest hole in the draw-plate, which is firmly fixed to a bed; a pair of pliers lay hold of the point, grip it firmly, and these pliers are connected, by means of a chain, with a drum having motion from an engine-shaft; the drum begins to revolve, the chain is wound on and draws the pliers holding the point of the rod towards it, and by this means the rod is drawn through a hole of a smaller diameter than itself, it therefore becomes smaller in diameter and proportionately longer after the first operation; it is also much *harder*, less pliable, and subject to be broken if bent short. The reduced wire is placed in a close furnace at a uniform temperature (composed in most cases of charcoal); it is here softened or annealed, is again taken to the draw-plate, passed through a still smaller hole, and this operation is carried on until the wire has reached the proper diameter, or corresponding to the number of the wire-gauge required. Thus a rod is taken of about $\frac{1}{4}$ in. diameter, it undergoes this operation of alternate reduction of size by drawing and annealing or softening in the charcoal furnace, until it reaches, say the "No. 16" wire-guage, which is about $\frac{1}{16}$ in. diameter, and the length of such a wire at this size will be twenty-five times the length of the rod from which it is drawn: thus a rod fifteen feet long produces a wire of 375 feet or 125 yards long, or thereabouts. But the operation of drawing or reducing the size of the wire-rod has not only increased the length twenty-five times in the present case, but it has also increased the strength of the material to resist tension to the extent of three times its former strength when in the character of a rod, as will be seen by reference to Table A.

The character or structure of the material itself is considerably altered by the several operations,—the cubical arrangement of the particles in the rod is converted, and becomes in the wire a fibrous silky structure, like charcoal in appearance at a fracture; the cohesion of the particles is so increased, and the pliability and power of receiving a considerable amount of torsion and bending without injury or disintegration so obtained; and this material becomes in this form suited to the manufacture of pliable ropes, taking the place of hemp, flax, and other fibrous substances used for that purpose.

Of some of the peculiarities of wire drawn from the same description of rod iron, but which has been subjected in the process of manufacture to the heating action of different descriptions of fuel, and of the difference, in some respects, between "hard" and "soft" wires (*i. e.* wire which in one case is left as it is produced from the draw-plate and without annealing, in appearance *bright*, in the other, where it has been afterwards

annealed, and is in appearance *black*), it is perhaps not necessary for the present purpose to enter upon, further than to remark, that the difference is discernible and marked, in the first place, and in the second, the strength of the bright or hard wire is superior, and its pliability is inferior to the soft or black wire, rendering it necessary to use the different kinds of wire for different objects—*i. e.* the purpose to which the article of manufacture is to be applied determines the kind of wire most suitable, and which is hereafter more fully explained.

The following table gives the strength of single iron wires of different gauges, from No. 10 Wire Gauge to No. 26, both inclusive :—

No. of Wire Gauge.		lb.	oz.
Single Wire	10 .... Broke at	798	2
,,	11 ,,	684	15
,,	12 ,,	564	11
,,	13 ,,	450	2
,,	14 ,,	345	5
,,	15 ,,	304	9
,,	16 ,,	210	0
,,	17 ,,	152	14
,,	18 ,,	132	6
,,	19 ,,	119	0
,,	20 ,,	108	5
,,	21 ,,	97	8
,,	22 ,,	86	8
,,	23 ,,	55	7
,,	24 ,,	31	2
,,	25 ,,	25	3
,,	26 ,,	18	4

These tests are the results of repeated experiments made at different times, and found to vary but little.

Having given the strength of different gauges of iron wire, the following table is the result of an experiment on the *strength* of platina, gold, silver, and copper wires, the diameters supposed to be $\frac{1}{10}$ in. but varied; the result is not, however, borne out by calculation, nor is the relative quality or hardness of each given.

		dwt.	grs.		lb.
Troy Weight	Platina..	8	5	Broke at	419
	Gold ...	5	10	,,	394
	Silver ..	4	14	,,	260
	Copper .	3	12	,,	180
Charcoal Iron hard....		3	0	,,	310

In illustration of the increments of strength by the process of drawing, the next experiment will exhibit a striking example, which is at the same time curious and interesting.

Comparative test between a $\frac{1}{4}$-inch Rod of Iron, and a $\frac{1}{4}$-inch Patent Wire Rope, of equal length :—

				ton.	cwt.	qrs.	lb.
$\frac{1}{4}$ in. Iron Rod	14 ft. long,	10 lb. weight,	broke at a strain of	4	2	12	
$\frac{1}{4}$ in. Wire Rope	14 ,,	6 ,,	,,	7	6	0	20

It should, however, be remembered that, whilst the rod is solid and weighs 10 lb., the rope is composed of No. 16 gauge, hard wires, lying parallel side by side, and bound together with interstices between each wire, and only weighs 6 lb.; the result bears out fully the remarks upon this head in the former portion of this paper.

Having now shown the alteration which this material undergoes, and the manner in which it becomes suited for the manufacture of the article of rope as a substitute for hemp, &c., it will be necessary to go back and shortly state the information possessed regarding the history of the application of metallic wires for this purpose.

In 1828 or 1829 Mr. Andrew Smith, Engineer, appears to have made, for experimental purposes, a small rope composed of fine wire laid or twisted together; it further appears that this rope, which was made for a particular purpose where cords and chains had been found unsuitable, was applied in their stead, but of its success nothing is stated. Although he appears to have considered it as an invention at the time, and kept it as secret as possible, the purpose for which it was applied and that part of its application were known to other persons. He does not appear to have prosecuted the invention for some years, although it is said he was engaged from 1829 to 1834 in making practical experiments on the strengths of materials, and had obtained seven or eight patents between the years 1828 and 1835 for other inventions, yet the first patent for wire rope was not secured until January, 1835.

Previous, however, to the latter year, he had evidently been making experiments in the manufacture of this article, for at the date of this patent he appears to have been in treaty with the Ordnance Board for the manufacture of cavalry bridles, reins, straps, and other like articles, from his new-invented cords or ropes, which it was represented would be a great improvement over both leather and chain, possessing the strength and resistance to a sabre-cut of the latter, with a pliability nearly equal to the former; without the great size and weight of the chains, and at less cost.

The principal application of this rope would appear to have been intended for the standing rigging of ships.

At the end of the year 1835, or beginning of 1836, progress had been made in the manufacture of this article on an extensive scale. Powerful machinery had been erected, and rope made at the works at Great Grimsby, and various tests made and published of the strengths of different sizes and forms of ropes.

Early in 1836 another patent was obtained by Mr. Andrew Smith "For the invention of an improved mode of manufacturing belts, bands, and straps, to be employed in place of ropes or chains, and for other useful purposes."

In December, 1836, Mr. Andrew Smith obtained another patent for improvements on his former patents.

During 1836 several small vessels were fitted with the patent wire rope for standing rigging, and it was proved to answer perfectly. For colliery purposes also it was applied, and gave great satisfaction. For fire-escapes, and a great variety of purposes, it had also been introduced.

In 1837 the Admiralty appear to have interested themselves officially in the matter, with a view to practically test its value for the navy; and ordered a set of experiments to be made with the government testing-machine at Woolwich dockyard, to test the comparative strengths of the patent wire rope and their best Russian hemp ropes. Although repeated tests had

been made, they had not been made officially; and the following is a copy of the report upon the experiments made March 8th and 11th, 1837 :—

GOVERNMENT HEMP ROPE.

Circumference.	Length.	Stretched.	Broke at.
in.	ft. in.	ft. in.	
12	12 0	3 0	22 Tons
10	12 2	2 11	18
7	11 1	1 8	9
5½	4 10½	0 11	6
5	11 3	1 7	5
3	4 10½	0 10½	2½
42½			62½

ANDREW SMITH'S PATENT WIRE ROPE, SALVAGE.

Wires.	Gauge.	Circumference.	Length.	Stretched.	Broke at.
		in.	ft. in.	ft. in.	
343	14	5	12 0	0 3	30 Tons
284	15	4	12 3	0 3	*17
285	17	3	11 1	0 3	*15½
145	17	2	11 3	0 3	9½
72	15	1⅞	4 10	0 2½	8½
34	18	1¼	4 10	0 0	3½
		17⅛			82

The above tests were perfectly satisfactory, and considered surprising by the naval gentlemen present on the occasion. The experiments were made twice over by the government officers, and the results almost exactly alike.

From a want of knowledge in naval men respecting the properties of materials, it was found difficult to convince them of the why and wherefore of the superior strength, &c. of a rope made from iron wires, and with the view to explain the effect of the alteration of the form of the material and the influence on its strength, a further test was made; the results of which were considered highly satisfactory by those who before had some difficulty in comprehending the cause of the superiority of the wire.

In 1838 considerable progress had been made in the introduction of the patent wire ropes, especially among the shipping interest; in the mining districts, it was being gradually introduced.

The Admiralty appear to have adopted it in the navy, and taken it up in earnest; various experiments, tests, and reports were made by their orders, and in the beginning of the next year they had several vessels fitted.

In March, 1839, Mr. Andrew Smith obtained another patent for his invention of certain improvements in the manufacture of ropes, &c., which invention applies to that mode or method of making or manufacturing ropes, cords, or cable, in which several strands of material are twisted or coiled one round the other, as is the usual method of making ropes, cords, or cables of hemp or other fibrous materials.

In addition to the various tests to which the wire rope was submitted, and the results given, the following table was prepared for the Lords Commissioners of the Admiralty, and embodied in a report to their Lordships :—

* Splice drew.

TABLE showing the comparative merits between Hemp and Wire Rope as applied to the different class ships of her Majesty's Navy, as regards Price, Weight, and Size, the strength of each, as proved by the testing machine and by experience, being equal.

Hempen Rope, £40 per Ton.					Wire Rope, £60 per Ton.					
Class of Ships.	No.	Average Weight per Ship.	Total Average.	Total Cost.	Class.	No.	Average Weight per Ship.	Total Average.	Total Cost.	Total Saving.
Guns.		tons. cwt.	tons. cwt.	£			tons. cwt.	tons. cwt.	£ s.	£ s.
120	12	30 0	360 0	14,400	120	12	15 0	180 0	10,800 0	3,600 0
80	18	28 6	509 8	20,376	80	18	14 3	254 14	15,282 0	5,094 0
74	11	27 0	279 0	11,880	74	11	13 10	148 10	8,910 0	2,970 0
50	6	28 10	171 0	6,840	50	6	14 5	85 10	5,130 0	1,710 0
46	9	15 0	155 0	5,400	46	9	7 10	67 10	4,050 0	1,350 0
28	22	12 16	273 12	10,944	28	22	6 8	136 16	8,208 0	2,736 0
18	36	12 0	432 0	17,280	18	36	6 0	216 0	12,960 0	4,320 0
10	36	3 5	117 0	4,680	10	36	1 12½	58 10	3,510 0	1,170 0
Schooners.....	13	2 5	29 5	1,170	..	13	1 2½	14 12½	877 10	292 10
Cutters.....	47	2 0	94 0	3,760	..	47	1 0	47 0	2,820 0	940 0
Steamers	62	2 10	155 0	6,200	..	62	1 5	77 10	4,650 0	1,550 0
Transports	50	4 10	225 0	9,000	..	50	2 5	112 10	6,750 0	2,250 0
Lighters	50	1 4	60 0	2,400	..	50	0 12	30 0	1,800 0	600 0
	376			114,330		376			85,747 10	28,582 10

The great advantages arising from the use of wire rope instead of hempen rope, are its being stronger for the same size in hemp, or lighter and smaller for the same strength, cheaper first cost, and more durable, more difficult to cut, and therefore not subject to the serious and most sudden danger to which hempen ropes commonly expose life and property in mining operations.

It is scarcely necessary to recite instances of accidents arising from this cause in the coal and iron districts of this country; they have been of so frequent occurrence, as the pages of the *Mining Journal* afford abundant evidence.

An objection having been raised to the wire rope "breaking off short without warning," the following experiment, which took place at the Iron Chain Cable Works of Mr. Lewis at Withymoor, near Dudley, July 25th, 1840, is reported by that gentleman:—

Description.	Size.	Bore airly without Breaking.	Broke at.	Second Breaking.	Third Breaking.	Weight per Fathom.
	in. in.	tons.	tons.	tons.	tons.	lb. oz.
Flat Rope ..	4 by ½	11	11½	6	3	7 6
,,	3½ ,, ⅜	7	7½	4	1	4 15
,,	3 ,, $\frac{3}{16}$	2½	2½	2	..	2 5
Round Rope	3	16½	17	8	3	7 0
,,	2½	12	13	5	2	5 13
,,	1¾	6½	7	4	1	2 13

It will be seen by the above, that instead of breaking short, like chain or hempen rope, it took three separate strains to break it entirely.

Mr. Matthias Dunn, a gentleman well known to the scientific world in connection with practical mining affairs, and whose talent and ability as a mining engineer stand pre-eminent, speaks of the merit and value of wire rope, at this time, in a letter to the editor of the *Mining Journal*, in a manner which must be at once conclusive as to its merits.

The next point of any interest in connection with this subject is the enrolment of Mr. Newall's specification in February, 1841, and its publication in the following month. The only feature of novelty in this patent appears to be a very ingenious arrangement of machinery for making wire rope, whereby the operations of forming the strands and laying up, hitherto done by two machines, are by his done at one and the same time, and in the same machine, thus effecting a great economy both of time and room, and a certainty of uniformity in the laying or twisting of the rope.

The machine consists of a great many parts and numerous toothed-wheels and gearings, some of which must revolve at a very high velocity, and may in this respect be faulty and liable to derangement; but on the whole, if the machine can be made to work correctly and economically, it will doubtless be of much importance for manufacturing ropes with a limited number of wires (36).

What is claimed in this patent regarding the wire being without twist *in itself*, and the introduction of a core into *each* of the strands, and into the *centre* of the *rope*, in the process of manufacture, is not peculiar to this patent, *and is not new*, it having been the practice since the time when wires

were first laid into strands and ropes, to prevent the wires being twisted or "wrung."

As to six-strand rope with hempen hearts or cores, which he claims as exclusively his invention, it certainly appears there is no novelty in that. Ropes of six strands with cores, as made by Mr. Andrew Smith, were tested by that gentleman certainly in 1839, if not before; but they appear to have been sold and in use at the end of 1839 and beginning of 1840.

The other improvement claimed by Mr. Newall in his patent, is from a mode of fitting or fastening the wire rope, which appears to be original for the purpose.

It does not appear that Mr. Newall in this year made and sold any wire ropes under his patent, although he is understood to have been making extensive preparations for doing so. A large machine upon the construction described in his patent was in course of manufacture at Dundee, and it is understood that it had to be abandoned, great difficulty having been found in getting the machine to work at all; and in the end the machine was altered altogether in its arrangement and mode of working.

In July, 1841, several experiments were made at Messrs. Brown, Lennox, & Co., Chain Cable Works, Mill-Wall, on the 21st July, and at her Majesty's dockyard at Deptford, on the 27th July. The ropes were Mr. Andrew Smith's patent, and were pieces of the rigging of a vessel which had been fitted some time. The tests were made with a view to show the comparative strength of the different kinds of rope.

	tons.	cwt.	qrs.	lb.
2¾ inch, selvage.....	12	2	2	6
3¼ ,, 4-strand hawser.....	12	19	2	16
3¼ ,, 6 ,, ...	10	14	2	12

In the same year a patent was obtained in Belgium by Mr. Lewis Goens, for making flat ropes of iron wire; they are described as being exactly like those which had been in use in this country since the year 1836.

In the same year (1841) a patent was obtained by Mr. John Baptist Freed Wilhelm Heiman, of Ludgate-hill, for improvements in the manufacture of ropes and cables. The specification describes a plan of making wire rope, in a long rope-ground, by stretching a number of wires to the length required, and laying them together by means of a machine on a sledge, something similar in its action to a common rope-jack, but having a large drum, on which the rope is wound up as it is made, at one end, and at the other, a machine having six drums of smaller size, whereon the strands are wound and given out from, according to the length of the rope required to be made. The wire and strands are borne up at different points along the rope-walk by frames, and the whole is laid together much in the same way as common hempen ropes.

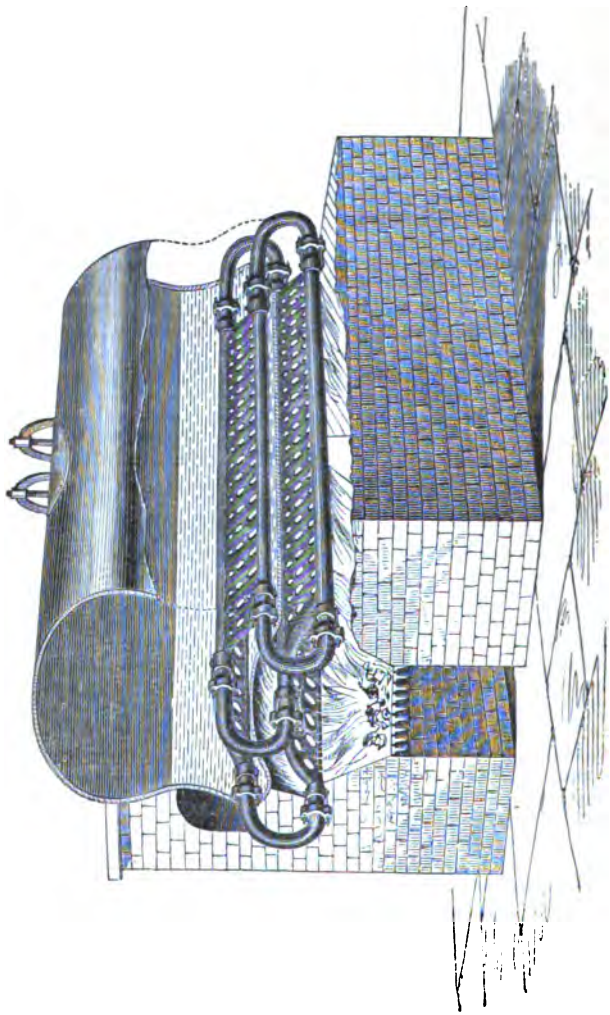
The preceding observations, which have been carried to an unexpected length in treating on the various patents, will doubtless be read with interest; and affording evidence of the several improvements made, and the advantages attendant on the use of wire rope, it is to be hoped will lead to its further introduction and application as tending to the security of life and property, while its economy in weight and cost, as well as its lasting properties, will be readily acknowledged.

IMPROVEMENTS IN GENERATING STEAM AND EVAPORATING FLUIDS.

BY THE EDITOR.

THE importance of any invention by which increased power is obtained, or a saving effected in the fuel consumed, is one which must be hailed as a grand desideratum by the miner and manufacturer. When it is considered the vast consumption of coal, even in the counties of Cornwall and Devon, any saving, however slight, whether arising from improvements in machinery, or any other mode whereby fuel is saved, is a matter of importance. The average quantity of water evaporated by 1 lb. of fuel we believe does not exceed 7 lbs., while by a patent lately secured by Mr. Wright, from 11 to 12 lbs. of water have been evaporated, or 75 per cent. over the ordinary power obtained, while one of the main advantages attendant on this invention is that of the reduction in the cost and weight of the boilers employed, not to advert to the saving of coal. That the economy observed can be fully carried out we believe no question exists, inasmuch as an engine with boiler, and cellular plates communicating with the boiler, as described in the patent, has performed a duty approaching to upwards of 12, and this in the presence of some of the first engineers, under the direction of Messrs. Galloway, Armstrong, and others.

The claims put forth in the patent consist of the principle or mode of construction and application of tubes, and a particular kind of cellular vessels or plates, charged with water or other fluids, whereby heat may be transmitted to the interior of steam-boilers or tanks containing water intended to be boiled or evaporated. The system of evaporation pursued is that of the circulation of hot water through small tubes, or an endless tube, whereby the water in that portion of the tube is expanded and ascends. The water so contained is capable of being raised to a temperature of 400° to 500° Fahrenheit without forming into steam, thus putting the contents of the coil in motion, the heated water passing through the vessel or boiler and giving out a portion of its heat, then descending by its gravity it returns to the fire and takes up another charge, and, to use the words of the patent, "thus every particle of the water successively becomes the recipient and transmitter of caloric from the fire to the fluid to be boiled or evaporated." It is proposed that the tubes in the cellular plates or vessels shall be of iron, gun-metal, or suitable alloys, as the flame can only impinge on the boiler by passing through the interstices of such cellular vessel.



MUNT & BROWN'S PATENT GENERATOR.

The specification then goes on to describe the manner in which the plates shall be cast or moulded, and also in forming the curves or cellular plates, while it is to be observed a considerable saving is to be effected in the increased durability of the boiler, which in itself is a very important consideration.

We deem it unnecessary further to follow out the specification of the patent, being content with drawing attention to an improvement whereby great economy may be observed in the working of our mines and manufactories, the patentees undertaking to guarantee a saving of at least 25 per cent. on the fuel previously used by the ordinary boiler; at the same time, by getting an increased power in a reduced space, a considerable saving is not only effected in the construction of the machinery, but also the space occupied, which, with the saving in fuel, form most important features as connected with steam navigation. The diagram we have introduced will best illustrate the nature of this economical and vast improvement in generating steam.

PROCESS OF CARBONIZING TURF WITHOUT CLOSE VESSELS,

The Peat furnishing its own Caloric, without producing Ashes.

BY DOMINIQUE ALBERT, LL.D.

When, in 1835, I built my present works at Cadishead, I was chiefly induced to choose the place on account of the proximity of both turbaries, Chat Moss and Barton Moss, having previously ascertained that I could make with turf as good charcoal as with wood.

As the charcoal I wanted was for some chemical purpose other than to be used as fuel, the first condition of the carbonization was, that it should produce a vegetable black, free from the mineral substance mixed with it, as is always the case when turf is carbonized in Ireland, to supply the hearths of some country smithies. I began, then, by submitting the turf to a dry distillation in iron retorts, five feet deep to four feet diameter, covered with strong sheet-iron caps, to which I adapted cast-iron pipes. I soon found, however, that the quantity of auxiliary mineral fuel required to burn the turf, owing to the distance of seven miles from the nearest pits, rendered this method too expensive to be continued.

I expected that the acid would compensate for the price of the coal, but I could never get it above two or three degrees; besides,

the pyrolignous alcohol diluted in the acid existed in a very small proportion. The tar, which was comparatively abundant, contained the greater part of the spirit; but the low price of tars in general offered me no encouragement to proceed.

I knew, by the discoveries made by my countryman, Mr. Merle, in 1834 and 1835, that certain species of turfs gave a richer and superior gas than either coals or oils, and I convinced myself that the peats in my neighbourhood were of an excellent quality for such a purpose, but I did not feel inclined to set up any apparatus to save that produce, so I turned all my attention to find a cheaper mode of producing pure charcoal.

I had latterly observed the Irish in their process, which consists of setting fire to a few turf cakes placed on the ground, so as to let the air play between. As soon as these cakes are burning, they heap round and above other cakes, which very soon ignite also. They continue to feed thus this heap of fire, till it reaches about five feet in height, and six or seven at its base. They let it burn until the whole appears in a complete glow, when they cover it with large wet sods, either of soil and grass or heath sods, from the surface of moss land. This careless, but cheap and easy manner, causes the charcoal to be mixed with a quantity of uncarbonized vegetable, marl, sand, stones, and a notable proportion of ashes, all matters which do not affect the iron jobs with which they come in contact.

The Dutch I saw, many years ago, carbonizing peat for domestic purposes, in small conical furnaces, as common with them in the country places as the bread ovens are here. They light the turf from below; and, when the combustion is nearly completed, they close the top and bottom. Their method, though superior to the Irish, and well adapted to their object, is neither as complete, nor does it give so pure an article as I wished; besides, I found its application almost impossible on a large scale.

Amongst the different plans and instructions I consulted to assist my experiments, I gave the preference to a large round perpendicular furnace, in which, according to Dumas (Chemistry applied to the Arts), Mr. La Chabeaussiere distils wood.

After having studied what modifications were necessary to render Mr. La Chabeaussiere's furnace useful for peat's carbonization, without saving either gas or liquids, I constructed the following kiln:—On a solid soil, I made an excavation from ten to twelve feet wide at the top, nine feet deep, and nine in diameter at the bottom, which I covered with a dry brick floor, that had a convexity of six inches. I lined this hole round with a dry brick wall, in the way of a common pump pit. At four equal distances at the bottom of the round wall, I opened an air-hole of about four inches square, and continued it in the form of a narrow chimney outside the wall, to the height of about six feet, when I prolonged

it about six feet more, but in a horizontal direction. For the top of this kiln I had a sheet-iron cover made, a few inches wider than the diameter of the brickwork, of a convexity of two feet, with a round hole or chimney in the centre, one foot high, and nine inches diameter, provided with a cover and handle similar to that of a canister, and at a foot from the extremity of the large cover, are cut out four auxiliary chimneys, at equal distances one from the other, with a four-inch diameter. Four strong iron rings are fixed to the cover to receive the hooks of a chain, which, by means of a donble purchase, raises or lowers the cover.

When this furnace, says Dumas, is filled with wood, the cover is lowered down, and some firebrands are precipitated through the central chimney to the bottom of the kiln; the wood being placed so as to leave a sort of funnel open. By means of the four blowing air-holes, the fire is very soon spread in all directions, and its progress is to be regulated by shutting or opening the smoke and air-holes, according to the direction of the wind.

These rules, which no doubt did answer when wood was to be distilled, were inefficient when applied to the carbonization of peat; but by dint of trials and patience, I succeeded beyond my utmost expectations, upon the following plan:

I make two tunnels of inch board, nine feet high and eight inches square, with some hand-holes from distance to distance. These tunnels I place in the kiln along the side, in order that the bottom end may correspond with one of the four air-holes; one of my workmen descends then to the floor of the furnace, and forms an aerated bed with peat, by setting the cakes upright, with their tops inclined one towards another, so as to create a good draught, which must, as much as possible, run in the direction of both air-holes where the tunnels are standing. It is necessary for this operation that the cakes be entire and dry, as pieces would intercept the air, and a wet cake would paralyze the action of the fire. After the setting of this bed, the peat is thrown down upon it, and left in the natural confusion of its fall, only it is required that a man place round the tunnels the turf cakes in regular order, to build like a chimney round these moveable tubes. When the kiln is filled and heaped up about three feet above the level of the hole, the tunnels are drawn out by means of their hand-holes, and leave two square passages from top to bottom. In these temporary chimneys, a few incandescent peat cakes are thrown, and on these some broken pieces of turf, till the passages are filled; but as the air plays more freely through these former chimneys, some barrowfuls of peat crumbs will shut the too wide pores, which places are easily seen by the greater volume of smoke escaping from them. The kiln left open, to facilitate a more general conflagration, is not covered before the heap of turf cakes has sunk to the level of the brickwork. In this state, the cover is let down, and some soil is brought round

its border to intercept the escape of smoke. In this stage of carbonization, all the air-holes with the large and small chimneys are open.

As soon as the fire is perceived through either of the small chimneys corresponding with the passages where the fire has been lighted, the horizontal mouth of the same air-hole is to be shut with a piece of brick and some marl, and the others are to be successively stopped in the same way, the moment the redness of the fire can be distinguished. If there remains any doubt of the perfection of the operation, a pole about fourteen feet long should be thrust through the hole where the carbonization appears incomplete, and by thus gauging to the bottom of the furnace, you will immediately be aware of the state of the charcoal, which you can remedy instantly, by opening the air-hole opposite the place examined.

When the smoke begins to abate, you place the cover on the central chimney, but so as to shut only the half of the aperture, taking care at the same time to direct the open part of the cover towards that part of the kiln which you might consider not so perfect as the remainder. At last, when the eruption of smoke has ceased, you shut all chimneys immediately, and the operation is at an end. It requires generally twenty-four hours to complete the carbonization of one furnace, and sixty hours for carbonization and cooling of the charcoal. A kiln of these dimensions can receive between three and four one-horse loads of peat, of about fourteen hundred-weight.

There are three kinds of peat. The white, or top of the moss land, is the lightest, and consequently the worst; it is sold from four to five shillings the load. The brown, which comes from the second stratum, is much better, being more compact, and sells at five shillings and sixpence per load. The black, or best quality, sometimes called iron-turf, is very hard and heavy; it gives an intense and sharp heat; produces a thick black smoke, with strong and unpleasant smell; it burns slowly, and is bought at six shillings. The incineration of the black turf leaves heavy reddish ashes, whilst those of white turf are of a sulphur yellow, and those of the brown have often a sort of orange tinge.

The peat ashes which owe their alkaline quality chiefly to the presence of lime, are considered a good manure for grass and clover, and used as such in the north of France and in Belgium. March and April are the best months to use them. They are generally sown during damp weather, and will have a good effect used with any plant, at its first appearance above ground. I tried them last year with pease and other vegetables, and perceived in one instance, that the use of them cleared the cabbage plants of the insects that were devouring them.

In order to get the kiln to act more regularly, it is well to carbonise each sort of peat separately. I have at present four

furnaces or kilns at work ; they are constructed between two rails, on which I have built a moveable frame, with a roof covered with a tarpauling. This skeleton of a house answers two purposes ; namely, it enables the men to fill and empty the kilns in all kinds of weather, and affords to the whole line the use of the double purchase to wind up the heavy iron covers.

The white turf gives a fourth of its weight of charcoal, the brown a third, and the black one-half.

The nature of charcoal from peat is a great deal less pyrophoric than that of wood charcoal; and during the four years that I have had always large quantities in the interior of my works, I have not had a single instance of a spontaneous ignition, whilst I had two accidents of this nature, with wood charcoal, in the short space of six weeks.

THE COST-BOOK SYSTEM.

BY THE EDITOR.

THE question has been oft raised by capitalists and parties interested in mines, as to the solution of what constitutes the cost-book system ; and without assuming any legal knowledge, or wishing to put a construction on the usage other than its general application, we shall endeavour simply to lay down such rules as we consider are embodied in the system, and on which it may be said to be based. The paper, by Mr. Stokes, on the Stannaries, which will be found in the earlier portion of the present work, enters into the subject, and may be considered an authority, emanating as it does from a gentleman so competent to explain and render clear that which is but too little understood, and on which so great a variety of opinion is known to exist. Certain broad principles may be admitted, yet the details and minutiæ, which vary in almost every case, remain undefined, and uncertain as to whether they form a component part of the cost-book system, or otherwise. It is somewhat surprising that so many tens, nay, hundreds of thousands of pounds, should be invested in mines worked upon the cost-book system, without any specific code of laws being recognised or laid down ; which, however, says much for the integrity and fair dealing of the Cornish miner or adventurer, as it may be said to be rather a code of moral laws, and based on honour, than that of any legislative enactment or legal system. That it would be highly desirable certain rules should be laid down and clearly understood, is, we believe, generally admitted, and the several cases reported in our pages will at

once point out the necessity for some course being adopted whereby doubts are removed as to the meaning of the term and the customs observed, which it will be our object in the present instance briefly to express the opinion we entertain, and to afford a sketch of such rules which we consider should be embodied in the cost-book, as being the foundation and grounds of the system observed in the working of the mines.

The following are the rules, or others of like effect, which we consider should be entered in the cost-book as the code of laws applying to the working of the mine, and which we have no hesitation in saying would be recognised by the Vice-Warden :—

The mine is hereby declared to be divided into equal parts, or shares, and held respectively by the several parties whose names are subscribed hereunto.

The system of management, and mode of carrying on the operations of the mine, and all matters attendant thereon, shall be enforced and carried out under the system generally known as the cost-book system, and referred to in the Act 7 & 8 Vict., cap. 110, clause 63, subject to the following, and any other special minute, or regulation, that may hereafter be made for the internal government of the affairs of the mine, not inconsistent with the general management under the cost-book system.

1. The accounts to be made up monthly, and discharged by the purser, or agent employed for that purpose, who shall enter, or cause to be entered, the monthly cost-sheet, in a book to be kept for that purpose, to be denominated the "cost-book," which this book is understood to be.

2. That a meeting of the adventurers shall be held at the mine, or at some convenient place, to be appointed from time to time, at least once in every two months, when the accounts of the preceding two months, with the balance, and all matters appertaining to the financial affairs of the company, shall be submitted, and minutes of the same entered into the cost-book, and signed by the respective adventurers present. That a list of shareholders, or adventurers, shall also be prepared, and entered in the cost-book, at such several meetings, and a statement submitted of the arrears, if any, of calls previously made.

3. That at all such meetings, upon the inspection and approval of the accounts and vouchers, the adventurers present shall have full power to make any call, or calls, which may be necessary for the prosecution of the mine, so that the amount so called does not exceed the sum estimated for the cost of the succeeding two months, in addition to paying off any engagements or liabilities which may at the time exist, and who may further declare a dividend, or division, of any surplus profit which may arise from working the mine.

4. That at all such meetings, the adventurers present shall have full power to appoint or remove, any agent, or agents, and to determine the rate of payment for services rendered.

5. That all meetings shall be called by circular, addressed, by post, to the several shareholders, or adventurers, giving at least days' notice of the intended meeting; and that the same be signed by the purser, or his representative, or such party as the adventurers shall from time to time appoint.

6. That at the meetings so held, the adventurers shall, if they think fit, appoint from time to time a committee of the adventurers, to superintend the management of the affairs of the mine, and to communicate with the purser, captain, or other agent, on the subject thereof; but the powers of

such committee shall not extend beyond the period of two months, although the members of such committee will be eligible to be re-elected, or may be removed, and other persons appointed in their room.

7. That any meeting may adjourn from time to time, as may be deemed expedient; but that it be imperative on the purser, or other agent, duly appointed, to convene a meeting at least once in every two months.

8. That at all meetings each adventurer shall have one vote in respect of every single share held by him, and in respect of which all calls then due shall have been paid up; and that a majority of votes of those present in person, or by proxy, be binding on the adventurers, whether present or absent.

9. That absent adventurers be entitled to vote by proxy—they deputing their powers to a co-adventurer; but that it shall be understood the proxy be confined to the specific meeting named, unless otherwise directly expressed.

10. That all transfers, or assignments, of shares be entered in the cost-book, and signed by the respective parties; but, in case of a transfer made by a separate paper, or instructions given to the purser, or other agent, by letter, such letter must bear the post-mark on the sheet authorizing the transfer, and not be enclosed in an envelope—and the original transfer shall be deposited with the purser, or other agent, and be by him entered in the cost-book.

11. That the captain, or resident agent, make a report on the operations at the mine, at least once a fortnight, or more frequently, if deemed desirable, and that such report be open at all times to the inspection of the adventurers, on application to the purser, or other appointed agent.

12. That a purser be appointed, into whose hands the moneys collected by calls on shares, and arising from sales of ores, and otherwise, shall be paid.

13. That a copy of the resolutions and abstract of accounts shall be transmitted to every adventurer, within seven days after the meeting shall have been held.

14. That any adventurer shall be at liberty to withdraw from the undertaking, on giving notice to the purser of such intention, and paying up his proportion of costs and liabilities; and, further, that he be entitled to his like proportion of ores, machinery, cash in hand, &c., up to the period of such surrender of his interest in the mine.

15. That the purser shall, when required by adventurers holding shares in the undertaking, convene a special general meeting, for such purposes as may be stated in the requisition, the same being mentioned in the notice calling the meeting, and due notice given accordingly.

Having thus given an outline of the fundamental rules of the cost-book system, according to the notion we ourselves entertain, we think it well to offer a passing observation on the application of the system, and the abuses committed under its title. Mine-jobbers and share-sellers, Bal decoy-ducks, and some few excommunicated "captins," who are too honest and too industrious to stay in the county, but who visit the metropolis to hold out the *copper* bait by way of realizing the *tin*, have their own notions of the cost-book system. Stock-jobbers, pseudo-merchants, bankrupt agents, and a host of the "smaller fry," are also to be found, who indulge in the notion that the cost-book is equally applicable in California, Brazil, Switzerland, Belgium, Wales, Scotland, and Ireland, and even in the Greenland Seas, without reflecting that there are no courts of law to apply the system to which recourse can be had; and, indeed, to any reflecting mind it must be at

once apparent that it is a "vile cheat." The 7 & 8 Vict., cap. 110, clause 63, has been referred to and printed in almost every prospectus which has come under our notice, to assure the shareholders that mines worked on the cost-book system are exempted from the operation of the Joint-stock Companies' Registration Act, forgetting at the moment that while mines worked on the cost-book system are exempted, no mention is made in the Act itself, nor in the prospectus citing it, as to the laws or conditions which constitute the cost-book system. We contend that it does not apply to mines worked out of the jurisdiction of the Stannaries Courts, and is not recognised by our courts of law; hence it is idle to hold out a lure to those who are not acquainted with its principles or its constitution. There can be no question that the cost-book system, properly observed, is one of the most simple and perfect of the kind, and is the best security that can be afforded to the mine adventurer, for to a certain extent, as a *société anonyme* (inasmuch that the adventurers may be personally unknown to each other, although their names are regularly entered on the cost-book), this security is afforded them. Meetings are held, or should be so, periodically, at which the amounts are made up, and the profit or loss divided *pro ratâ*, and provision made for the working of the mine until the next meeting shall be held. Every adventurer has the right of relinquishing or signing off his shares in the cost-book on paying his proportion of the costs and liabilities incurred up to that time, and on the other hand being entitled to his share of all moneys, ores, materials, &c., while, at the same time, it must be borne in mind that every individual shareholder is liable for the entire debts of the mine. This latter liability, however it may tend to alarm parties, is, we consider, the best safeguard to the mine adventurer. In the first instance, it teaches him the necessity of exercising caution and prudence in embarking in an enterprise, by first ascertaining the state of its finances, and the honesty and ability of those with whom he becomes associated; it next imposes upon him the necessity, if he would protect his own property, and consequently that of his co-adventurers, to see from time to time, at the bi-monthly meetings, that the several bills and vouchers are laid upon the table; he has a voice, in common with others, as to the nature of the workings for the forthcoming two months, and hence no liability can he incurred beyond; in fact, he is not merely the instrument in the hands of a committee or board of directors, but he is there in common with others to protect and superintend the application of his own capital. We trust that some member of the legislature will introduce a bill to render the cost-book system more clear, and that its application will be universal at least as regards the British dominions. The miner deserves the liberal support of the legislature, and we doubt not it would be cheerfully accorded him.

THE MINERAL TOPOGRAPHY OF GREAT BRITAIN.

BY A. W. TOOKE, M.A., F.G.S., ETC.

CORNWALL.

Geological Summary.

CLAY-SLATE or grauwacké is the prevailing rock in this county, through which granite is seen to rise, forming summits of some of the principal hills.

Granite appears at Calstock, on the eastern part of the district, and may be considered as connected with that of Dartmoor. Further west, it occurs largely on the high ground between Liskeard and Bodmin; is seen again on the hills of Carn-Marth and Carn-Brea, near Redruth; and forms the striking cliffs of the coast near the Land's-end.

The granite is surrounded often by greenstone or hypersthene rocks, and the clay-slate reposes upon these, or the granite where they are wanting.

The clay-slate is metalliferous near its junction with the granite; and we find the mines, therefore, in groups near these points—as in Gwennap, near Redruth, near Camborne, and also in the parish of St. Just, and in some parts intermediate and eastward near St. Austle, and in the parish of Calstock, near the river Tamar.

Besides the metalliferous veins which generally run east and west, the rocks are traversed by burrow veins, which have a direction approaching to north and south, and there are also large dykes of porphyry, generally nearly parallel to the metalliferous veins, which are locally called elvan-courses.

Mineralogy.

[**** In the following description, the old Cornish term *Huel* is used instead of that generally applied as *Wheal* to the several mines.]

Agnes, St.—Bismuth ochre, bell-metal ore, and porcelain clay; brown blende; fluor; common topaz; tin crystals; phosphate of iron.

Ann Huel, Hayle.—Black and grey silver ore, with native silver; snow-white acicular carbonate of lead.

Alfred Huel, Hayle.—Carbonate and arsenio-phosphate of lead; native silver in green carbonate of copper; calcedony; cubic, stalactitic, cellular, or swimming quartz.

Agnes, St., Huel Charlotte.—Deep crimson-coloured oxide of copper.

Ale and Cakes Mine, St. Day.—Sulphate of barytes.

Alternon.—Stream tin.

Austle, St., Huel Chance.—Native nickel, and in metallic veins, wavellite.

Abraham Huel, Crowan.—Copper glance.

Botallack, St. Just.—Grey and yellow sulphuret of copper; oxide of tin; purple copper ore; jasper; arborescent native copper; jaspery iron ore; arseniate of iron, or cube ore; sulphuret of bismuth em-

bedded in jasper; asbestiform actynolite in the felspar rocks; specular iron ore; hæmatitic iron; hydrous oxide of iron; magnetic iron pyrites; epidote; axynite. Botryoidal calcedony; brownish-white stalactitical and deep blood-red hornstone; blood-red jasper; actynolite.

Crown Rocks.—Thallite; chlorite; tremolite; black crystallized schorl.

A little north of Botallack.—Amorphous and crystallized axinite, associated with garnets; bright red arseniate of cobalt; cobalt pyrites; iron glance; tin pyrites; jaspery ironstone; hydrate of iron, or brown hæmatite; carbonate of iron.

Between Botallack and Huel Cock,—Asbestus in the prehnite vein, with nodules of prehnite in it; steatite enclosing oxide of iron; mesotype; in the prehnite vein stilbite; epidote or pistacite; stalactitic quartz.

Basset Huel, St. Agnes.—Compact vitreous silver.

Boys Huel, Endellion.—Common grey antimony; radiated antimony; antimonical ochre; plumose antimony. All these varieties of the sulphuret of this metal are associated together in quartz veins traversing the slate of the calcareous series.

Baget Huel, Illogan.—Native silver and sulphuret, with galena.

Billon Huel.—Rhomboidal specular iron ore.

Boscagel Downs, Morvah.—Specular iron ore in needle crystals, stellated; oxide of tin in slate; calcedony incrusting quartz.

Boulton Huel.—Carbonate of iron.

Beam Huel, St. Austle.—Grass-green arseniate of iron; tin in granite.

Briggan Huel, Perranzabuloe.—Yellow blende.

Baldhu Kea.—Brown blende.

Bude.—Calcareous spar.

Binner Downs.—Ditto crystallized in quartz veins.

Buller Huel, Redruth.—Calcareous spar, in six-sided prisms, with flat tops; uranite; red oxide of copper.

Bosaverne Mills—Amethystine quartz; crystals, enclosing chlorite in a moss-like form, and oxide of iron.

Bellon Huel, St. Just.—Prase; amethyst, in granite.

Bunny, The, St. Just.—Calcedony, with schorl.

Bell Huel.—Granite, with mica predominating over both the quartz and felspar.

Bell Huel, St. Erth.—Sulphate and phosphate of lead.

Blazey, St.—Stream tin.

Brothers Huel, Calstock.—Native silver.

Coverack Cove.—Diallage metalloïde; smaragdite; hyporstene or Labrador hornblende; sauserite, forming the diallage rock; schiller spar.

Cleggo Cliffs.—Dull-white felspar, with crystallized quartz; white mica.

Castle Huel, St. Just.—Felspar, in rhomboidal crystals in the slate rocks near.

Cleer, St.—Violet-blue and clove-brown quartz crystals; and at *the Cheesewring*—Soapstone and amianthus.

Carclase, St. Austle.—Porcelain earth; tin disseminated in granite.

Chycornish Carn.—Earthy chlorite.

Cornwall C.—In the felspar rocks asbestiform actynolite.

Crow Hill.—Gold in small quantities; stream-works.

Creed.—Ditto.

Crest, St.—Wood tin.
Carnon, Feock Parish.—Stream tin; gold in small quantities.
Callington.—Silicate of manganese, or siliciferous oxide of manganese, in a manganese quarry, one mile and a half south-west of this place.
Crinnis Mine, St. Austle.—Silver, with pyrites of copper; antimonial ore; grey copper, or fahlerz.
Coates Huel, N.W. St. Agnes Beacon.—Carbonate of bismuth in the granitic elvan.
Cost-all-Lost, Roach Parish.—Carbonate of bismuth, in quartz veins, intersecting granite.
Cock Huel.—Sulphuret of bismuth, in minute grey crystals; native copper; blue carbonate of copper; compact talc. In this mine, which is situated in slate, near its junction with granite, amethyst occurs in the latter.
Colomb, St.—Sulphuret of bismuth, of dark lead-grey colour, in state of water-worn pebbles; carbonate of bismuth; stream tin; wood tin.
Consolidated Mines.—Native copper, in capillary crystals.
Camborne Vean.—Purple copper, or bunt-kup-ferers.
Carnyorth Moor, St. Just.—Specular iron ore; steatite.
Carhayes.—Umber; cubic quartz.
Creva Wood, Callington.—Red oxide of manganese.
Castle Huel.—Calcareous spar in the slate cliffs below; pearl spar.
Crenver Crowan.—Sulphuret of copper.
Croffy Huel, Camborne.—Sulphuret of zinc.
Cadgwith.—Hexahedral crystallized carbonate of lime, with iron pyrites and asbestuous serpentine, and at the *Frying-Pan*, amianthus.
Coverack Cove, St. Keverne.—Brownish-green schiller spar, embedded in serpentine; native copper.
Cligga Point, St. Agnes.—Wolfram; kaolin.
Carvath.—Foliated copper glance; red oxide of copper.
Cliker Tor.—Common tremolite in the massive rocks at; serpentine of a dark bottle-green colour, in the fissures of which is found actynolite of a leek green; amianthus.
Carpenter Huel.—Compact malachite.
Carn Silver, Lemorna Cove.—Epidote; axinite.
Cock, Carn Huel, St. Just.—Axinite of a violet colour; garnet rock; greyish-white apatite, with hornblende: between this place and Botallack, prehnite; stilbite or foliated zeolite; radiated mesotype.
Cape Cornwall, Porth Just.—Actynolite; metalliferous quartz; oxide of tin, native copper; oxides of iron; red jasper; brownish-red quartz; scaly red iron ore.
Condurrow, Camborne.—Native copper, in granite.
Cook's Kitchen, Illogan.—Native copper; foliated copper glance; variegated copper; tennantite; friable lithomarge.
Camborne.—Native copper; foliated copper glance.
Carharrack, St. Day.—Capillary red copper ore; native copper; uranite black oxide of copper; mineral pitch or bitumen; blue copper; arseniate of iron or cube chrysocolla; axinite in a bed in clay-slate, associated with garnet and common schorl; red oxide of copper; mamillated arseniate of copper, in appearance much resembling wood tin in its radiated character; petroleum; asphaltum; arseniate of copper; cupreous arseniate of iron.

Delabole Slate Quarries, N.W. of Camelford.—Rock crystal; rutile perforating quartz crystals.

Dolcoath.—Compact tin-white octohedral cobalt pyrites; compact vitreous silver; tennantite; radiated red cobalt, or cobalt bloom; sulphuret of bismuth in minute crystals; purple copper; foliated copper glance.

Duchy, or Brothers Huel, Callington.—Compact vitreous silver, or compact hexahedral silver glance; dark-red silver, or antimonial sulphureted silver.

Drakewells, Calstock, 5½ miles east of Callington.—Molybdena.

Duporth, west of Charlestown, St. Austle.—Steatitic serpentine; actynolite.

Dinham on the Camel, near Padstow.—Limestone.

Ding-Dong Mine, Madron.—Jasper; fluor spar.

Devonshire Huel, St. Agnes.—Fluor spar of a green colour, and associated with yellow copper ore, and iron pyrites.

Dennis, St.—Mica, of a grey colour and lamellar texture; wood tin.

Diamond Huel.—Rock crystal, enclosing oxide of tin and copper, and iron pyrites.

Dennis Creek, Helford River.—Pudding-stone of fragments of grauwacké and quartz.

Dri, St.—Tennantite.

Drama, Lizard.—Granular serpentine.

Endellion Huel, Boys.—Axifrangible antimony glance, or bournonite; arseniate of lead; plumose antimony.

Edward Huel, St. Just.—Uranite; tile ore; black oxide of copper; malachite; arragonite in black and green chrysocolla.

Ewe, St.—Grauwacké slate; violet-blue and clove-brown crystals of quartz in slate.

Fanny Huel, Redruth.—Wolfram.

Fortescue Huel, Gwennap.—Brown blende.

Forraburry Cliff, near Camelford.—Slaty anthracite occurs as a layer in the black shale of this cliff.

Falmouth Huel in Kea.—Bunt-kup-ferers, or purple copper; phosphate of iron; oxide of tin; silver; zinc.

Five Lanes, near Launceston.—Hornblende.

Friendship Huel, Gwennap.—Blende.

Fore Moors, St. Columb.—Stream tin.

Gorland Huel, St. Day.—Arseniate and phosphate of copper; foliated and compact red copper ore; capillary copper ore; indurated tile ore; earthy red oxide of copper; hexahedral olivenite, or cube ore; white copper pyrites; molybdena; arseniate of lead; uranite native copper in cubes; blue carbonate of copper; malachite; chrysocolla; fluor; fire opal.

Garth Mine, Penzance.—Toad-eye tin in quartz rock.

Gossmoor, St. Denis, west of Rocherock.—Wood tin, associated with pebbles of various kinds of schorl rock.

Guarneck.—Galena, yielding seventy ounces of silver in the ton.

Godolphin Bal in Breage.—Apatite, or crystallized phosphate of lime, in slate near the junction with granite.

Gleaster.—Saussurite; diallage metalloïde; arenaceous magnetic iron-
In a diallage rock, south coast.

Golden Mine, Perranzabuloe.—Yellowish-green phosphate of lead; carbonate of lead.

Garras Mine, Truro.—Galena, yielding from sixty to seventy ounces of silver per ton; pearl spar, or magnesia; carbonate of lime in obtuse rhoimboids.

Gluvias.—Magnetic oxide of iron.

Gwyn Stenna.—Tungstate of iron; wolfram.

Germans, St.—Compact antimony.

Gwendra.—In diallage rock, mennaccanite.

Goonhilly Downs.—Serpentine.

Gweek in St. Martyn's, near Helstone.—In the clay-slate of the calcareous series; agate of a dull grey colour, clouded and striped with bluish white, possessed of very little beauty.

Gilbert Huel, St. Earth.—Tinstone.

Herland, Gwinear.—Native silver; wolfram; compact hexahedral silver glance; or compact vitreous silver; grey cobalt pyrites; sulphureted bismuth; black oxide of silver; bismuth, with arsenical cobalt.

Husband Huel.—Compact malachite.

Hayle Huel, Alfred.—Swimming quartz; carbonate and phosphate of lead, and various forms of calcedony.

Hope Huel, Perranzabuloe.—Blue lead.

Hewas Huel, St. Mewan.—Amethystine quartz.

Ives, St., in the vicinity of.—Asbestiform actynolite in the felspar rocks. From this circumstance this kind of felspar rock has been denominated *actynolite rock:* it always occurs near the junction of the granite and slate.

Jewel Huel, St. Day.—Tennantite; purple copper; petroleum.

Just, St.—Amorphous garnet, with axinite; sulphuret of bismuth, in minute grey crystals; magnetic oxide of iron, with green chlorite; reddle; red chalk; black hæmatite; native copper.

Isaac, Port.—Radiated grey antimony ore.

Indian Queens.—Red oxide of manganese.

Just, St., in the slate rocks of.—Asbestus; earthy chlorite; talc. In stratified rocks, which overlie the granite: basaltic hornblende; black tourmaline; common opal; fire opal; adularia.

Kayle Huel, Gwinear.—Black copper in granite.

Kitt Hill, Callington.—Wolfram; avanturine, traversing granite in the form of veins.

Keverne, St.—Amianthus, or flexible asbestus.

Kinance Cove.—Diallage; jade; compact felspar, or saussurite; asbestus; calcareous spar; talc; reddish-brown mica, with felspar; dull white felspar; precious serpentine.

Kind Huel, St. Agnes.—Indigo-blue phosphate of iron.

Kea.—Muriate of tin; apatite; topaz, with phosphate and carbonate of lime and tinstone.

Knill's Mausoleum.—One mile beyond, on the left side of the road, is a wall entirely of schorl.

Letcott, Laneast Down.—Varieties of manganese.

Lizard.—Native copper; green talc; compact felspar; asbestus; amianthus; steatite; serpentine with magnetic iron ore; talc; talc slate; axe-stone; and in the serpentine district, amethystine quartz; massive felspar, with green talc.

Lanlivery.—Stream tin; magnetic oxide of iron and pyrites; auriferous tinstone.

Luxilian.—Stream tin; garnet-coloured tinstone.

Lanarth, St. Keverne.—Mennaccanite.

Levant Mine, St. Just.—Grey sulphuret of copper. In this mine, which is situated in slate, near its junction with granite, amethyst occurs in the latter, and in the former on quartz, arragonite.

Lanescot Tywardreath.—Mamillated sulphuret of tin.

Lanteglos.—Argillite, or clay-slate.

Land's-end.—In the granite black tourmaline.

Logyan Rock, beneath the.—Schorl.

Lemorna Cove, St. Burien.—Axinite, or thummerstone. Its beautiful violet colour is not inferior to that of the well-known specimens from Dauphiny.

Little Bounds Mine, St. Just.—Black quartz; blood-red jasper.

Looe Bar, Helstone.—White and red carnelions; agate pebbles from thence to Porthleven.

Ladock, near Truro.—Black stream tin. The largest specimens of gold were found in these stream-works.

Mennaccan, Tregonwell Mill-stream.—Titaniferous iron ore; mennaccanite, or gregorite.

Mullion.—Three miles south of, close to the shore, is the celebrated *Gue-Graze* steatite or soap-rock, which same mineral appears to run in veins in the serpentine, and near this spot is found native copper and basaltic hornblende.

Muttrel Huel.—Foliated copper glance; arseniate of iron; blue carbonate of copper; malachite.

Menabilly, Fowey.—Molybdena.

Meraxion.—Epidote, or pistacite; asbestus; actynolite; axinite; iron; flint, or eisenkeisel.

Mexico Huel, Perranzabuloe.—Horn silver; earthy lead ore.

Mawnan Cliffs, Falmouth.—Ferriferous carbonate of lime; arragonite; sub-carburet of iron in thin plates among the laminæ of the slate, and small octohedral crystals of yellow sulphuret of copper.

Mewan, St.—Native silver; gold; wood tin.

Music Huel.—Native copper crystallized; red oxide of copper.

Maudlin Mine, Lanlivery.—Red ironstone, cronstedite; carbonate of iron; spathose iron; magnetic pyrites; pseudo-morphic crystals of wolfram; mispickel; arsenical iron pyrites in distinct crystals; blood-red jasper.

Minin, St.—Compact grey antimony.

Michael, St., Carhayes.—Common limestone.

Michael's Mount, St.—Apatite; oxide of tin; felspar; mica; white topaz; pinite; triple sulphuret of copper; antimony; lead; sulphuret and oxide of tin; malachite; fluor spar; wolfram; mica crystallized in hexagonal tables.—On the south side of the hill in the old mine-drift, tin crystals; carbonate of copper, and tin pyrites in veins in the granite.

Madron.—Silicate of alumina; corundum, reddish brown and massive.

Morna Cove, at the junction of the Granite and Clay-slate.—Common [illegible]; epidote or pistacite.

—, on the shores of.—Asbestiform actynolite is common in the

felspar rocks, occurring both disseminated and in the form of veins, several inches in thickness.

Mulvra Hill, Sancreed.—Pinite in granite.

Nangisel Cove, Sennen, near the Land's-end.—Amethyst lining elongated *drusy* cavities, in a large vein of amethystine quartz, which traverses pinitic granite.

Nanjenkin.—Oxide of tin.

Owan Vean, St. Hilary.—Native copper, in capillary crystals.

Owls Huel.—Hexahedral specular iron ore; calcareous spar; pearl spar; schiller spar with felspar; actynolite; hornblende with apatite.

Providence E. Huel, Lanivet.—Oxide of tin; yellow copper ore.

Poldory.—Native copper; purple copper.

Prosper Huel.—Foliated and compact red copper ore; native copper in capillary crystals; red oxide of copper crystallized; arseniate of lead.

Pentowan, St. Hue.—Wood tin.

Pednandras, Redruth.—Wolfram; compact fluor; arseniates of copper; black oxide of manganese; chlorophane; amethystine quartz; calcedony; float-stone.

Pol Huel.—Common galena, or lead glance, producing sixty ounces of silver in the ton.

Padstow.—Calcareous spar; common limestone.

Perranzabuloe, Huel Golding.—Carbonate of lead; in the cliffs, rock crystals.

Padstow, Pentire Glaze.—Carbonate of lead.

Penrose Huel, Helstone.—Yellowish-green phosphate of lead; carbonate and arseniate of lead; galena in large cubes.

Pentire Glaze, St. Minver.—Acicular carbonate of lead.

Park, Matthew's, St. Austle.—Ditto.

Poldice, Gwennap.—Galena in crystals; bitumen; wolfram; oxide of tin.

Polgine.—Red oxide of copper crystallized.

Prince George Mine, Gwinear.—Malachite; chrysocolla.

Pengilly Mine, St. Ewe.—Native nickel.

Polgooth.—Arseniate of cobalt; calcareous spar; pearl spar; amethystine quartz.

Penhale Mine, Perranzabuloe.—Galena.

Park Noweth.—Specular iron ore.

Primrose Huel.—Silicated oxide of tin.

Pengilly Croft, Breage.—Tungstate of lime; tin ore.

Pendeen Cove, on the south side of.—Steatite.

Porthonstack.—Greenstone, with serpentine.

Porthallo.—Compact talc; limestone.

Probas.—Grauwacké; stream-works with gold in small quantities.

Pendogget, near Padstow.—The same varieties of antimony, and similarly situated as at Endellion.

Polteworgie.—Ditto.

Polaphant, Launceston.—Calcareous spar. Ollareous serpentine, having a basis of potstone, with scales of diallage.

Petherwin, South, near Launceston.—Calcareous spar; limestone.

Perran Uthnoe.—Iron-flint, or eisenkiesel.

Permiscen Bay.—Limestone.

Rockferry.—Limestone.

Redruth.—Compact tin-white octohedral cobalt pyrites; common actinolite; purple copper; swimming quartz.
Rock Huel, St. Agnes.—Common tin pyrites or bell-metal ore in slate.
Roskeir.—Yellow copper ore with opal.
Roach Rock, Bodmin.—Schorl; yellowish-brown tourmaline.
Rose Huel, Newlyn.—Argentiferous galena.
Roach.—Oxide of bismuth; magnetic oxide of iron.
Roscommon Cliff, St. Just.—Red cobalt with axinite.
Rowe Huel Lead Mine, Helston.—Brown hæmatite.
Rose Warne Mine, Camborne.—Common and fire opal.
Relistian Copper Mine.—Floatstone.
Roach, St.—Wood tin.
Restormel, Lostwithiel.—Manganese in a large course of silicious rocks not far removed from the granite series.
Reeth Huel, Lelant.—Oxide of tin.
Silver Hill, Upper Carnon Streams.—Lead; copper; tin.
Scorrier.—Rock crystal; common tin pyrites.
Stephen's, St.—Native silver; uranite; apatite.
Sithney.—Wood tin.
Sparnon Huel.—Compact tin-white and grey octohedral cobalt pyrites; sulphureted bismuth.
Stenna Gwynn, St. Austle.—Common tin pyrites in granite; foliated apatite; massive talc; zeolite; soft wavellite; compact wavellite; mesotype; fibrous tremolite on decomposed granite with uranite; fluellite in minute crystals, with wavellite on quartz; wolfram; opal.
Stephen's, St.—Radiated grey antimony; stream tin; magnetic oxide of iron; plumose antimony; massive talc; porcelain clay; fluor.
Spearn Huel.—Grey sulphuret of copper in cubes; blood-red jasper.
Spinster Huel, St. Day.—Yellowish specimens of common opal.
Stennack.—Blood-red jasper.
Swan Pool.—Quartz crystal; the primary rhomboid, in a decomposing porphyritic rock.
Trevascus Mine, Gwinear.—Calcedony.
Tin Croft, Illogan.—Black oxide of copper; uranium; foliated copper glance; tennantite; iron glance; variegated copper; hexahedral olivenite, or cube ore; crystallized red oxide of copper; amianthiform arseniate of copper; purple copper; brown hæmatite; fibrous spathose iron; friable lithomarge or stone-marrow; ochreous brown-coloured floatstone.
Tolcarn.—Uranium; pitch blende.
Trevannance, St. Agnes.—Common topaz in slate.
Trewellard, St. Just.—Axinite; and south-east of the granite rocks, pinite; brown quartz in long transparent crystals.
Treworda, Kenwyn.—Stream tin-works, with particles of gold.
Treweather, near Port Isaac.—Varieties of the sulphurets of antimony, similar to those found at Endellion.
Tresavean.—Galena in large cubes, with copper.
Trugoe Mine, St. Columb.—Native bismuth; cobalt bloom; semi-opal.
Trelowarren, Lizard.—Granular serpentine.
Tregurthy.—Carbonate of bismuth.
Tol-vean, near Huel Cock.—Native wiry copper.

Treherby, Redruth.—Native copper, in minute crystals. Earthy bitumen, associated with yellow copper ore; petroleum.

Ting-Tang Mine, Gwennap.—Deep-blue carbonate of copper; milk-white arseniate of copper; red oxide of copper in porphyry.

Towan Huel, St. Agnes.—Spathose iron.

Tregurthy Moor, St. Austle.—Toad's-eye tin in massive quartz.

Trenance, St. Austle.—Blende.

Trebartha.—Red oxide of manganese.

Treburget Mine, St. Teath.—Galena in quartz veins.

Tintagel Slate Quarries.—Calcareous spar, with rock crystal; chlorite, and adularia.

Tintagel Cliffs.—Rock crystals of great purity found in the cliffs, and not only in the *Delabole* quarries, as erroneously stated by writers; adularia, or moonstone, in the veins which traverse the strata of roofing-slate, and are principally composed of quartz and calcareous spar.

Treliswell, Penryn.—Oxydulated iron.

Trugoe Mine.—Brown jasper.

Trenalt Polaphant, near Launceston.—Hornstone, in talcose limestone.

Trenwith Huel, St. Ives.—Phosphate of uranium; pitch blende.

Tramnack, near Helstone.—Garnet with copper ore.

Tresscow, Breage.—Tin; copper.

Unity Huel, St. Day.—Arseniates and phosphates of copper; beautiful crystals of red oxide of copper; silicate of copper; chrysocolla; arseniate of cobalt; cube ore; mamillated sulphuret of zinc; native copper; molybdena; fibrous brown zinc; tennantite; arseniate of lead; uranite; blue carbonate of copper; malachite; petroleum; asphaltum; fluor; massive asbestiform actinolite associated with quartz, chlorite, and oxide of tin, has been found near the junction of the granite and slate in the veins of this mine; glassy actynolite; blood-red jasper.

Unity Wood, Gwennap.—Arsenial iron pyrites, in distinct crystals.

Virgin Huel, Consolidated Mines.—Tennantite; radiated blue copper; native copper in cubes; crystallized red oxide of copper; blue carbonate of copper.

Velenoweth Mine, St. Ives.—Sulphate of lead.

United Mines.—Arseniate of copper; native copper; heavy spar.

Vincent, St., Huel, Callington.—Native silver, with muriate and sulphuret of silver.

Vor Huel, Breage.—Native copper, in minute crystals; arsenical iron pyrites in distinct crystals; oxide of tin.

Veryan.—Red oxide of manganese; common limestone; marl.

Unanimity.—Mispickel.

Wheal Kind, St. Agnes.—Prismatic-blue iron.

Werrington.—Calcareous spar.

Wherry, the, a submarine Mine near Penzance.—Chlorite occurs in porphyry; cobalt ochre.

Wendron, at Huel Trumpet.—Chlorite in granite.

Yeolm Bride, Werrington.—Limestone.

BEDFORDSHIRE.

Woburn.—Fullers'-earth; woodstone.

Aspley.—Fullers'-earth, in beds in ferruginous sand.

The fullers'-earth pits, two miles from Woburn, are in the parish of Wavendon, in Buckinghamshire, near the forty-sixth mile stone. The pits at Aspley-Guise have not been worked for many years.

BERKSHIRE.

A vein of fullers'-earth may be seen near Reading, in a field called Catsgrove.

BUCKINGHAMSHIRE.

At Wavendon, between Woburn and Newport Pagnel, are the celebrated fullers'-earth pits; one only is now worked. Rhomboidal selenites in clay near *Long Crendon*, and a variety of fossils in the yellow limestone near Dinton.

CAMBRIDGESHIRE.

Cherry Honiton.—In the chalk-pits, iron pyrites, with various fossils.
Burwell.—In the clunch-pits, cornua ammonis, &c.

CHESHIRE.

Alderley Edge.—Indurated black cobalt ochre, in red sandstone; iron; blue carbonate of copper; lead.
Northwich.—Rock salt.
North Poynton.—Extensive collieries.
Peckforton Hill.—Copper; lead; cobalt.
Dunkenfield.—Iron.
Runcorn, Manley, Bebington.—Freestone quarries. (The Bebington stone is whiter than the others.)
Mon Cop Hill, near Odd Rode.—Millstones are manufactured here.
Newbold, Astbury.—The only locality for limestone in this county.

CUMBERLAND.

Allonby, nine miles N.N.W. of Cockermouth.—Black coal.
Alston.—Green lead spar; phosphate of lead; carbonate of lead, or white lead spar; witherite; satin spar; selenite, twenty-seven miles east-south-east Carlisle.
Borrodale.—Compact graphite; prase.
Cromack Water.—Grey oxide of manganese.
Carrock Fell.—Bismuth.
Dufton, 3¼ miles north of Appleby.—Friable galena; sulphate of barytes.
Dufton Fell.—Coralloidal arragonite.
Eskdale.—Micaceous specular iron ore.
Lowes Water.—Lydian-stone.
Shap, six miles N.W. from Orton.—Molybdena in granite.
Skiddaw, at the summit of.—Chiastolite in acicular crystals.
Seathwaite, Village of, in Borrodale.—The most esteemed plumbago in Europe is obtained from a mine north of this place.
Alston Moor, one mile from Alston, near the River.—Satin spar; a variety of fluors; spars; carbonate of barytes; quartz; crystals; crystallized blende; arborescent carbonate of lime.
Keswick, or near.—Garnets.

Crosthwaite.—Epidote.
Egremont, or near.—Steatites.
Hilltop, St. John's.—Iron ore.
Crowgarth, near.—Hæmatite.
Calbeck, near Hesket, Newmarket.—Oxide of manganese; copper ore; molybdena.
New Biggen.—Gypsum.
Ducre, Little Hainton.—Marble, with shells.
Northend Lead Mine.—Asbestus.
Dale Lead Mine.—Peroxide of copper.
Tyne Bottom, near Alston.—Earthy-red cobalt.
Ullswater Lake, Swarth Fell.—Columnar clinkstone, in a deep ravine.
Whitehaven.—Cannel coal.
Barrock, near Nebsteps.—Kaolin, or porcelain clay.

DEVONSHIRE.

Barnstaple.—Wavellite occurs in the seams of the soft schist, provincially called shillet.
Beeralstone.—Galena, yielding 135 ounces of silver in the ton (South Hooe Mine); octohedral fluor, globular fluor, and beautiful cubic fluor and crystals of quartz; and in the neighbourhood, octohedral and cubic calcedony; arseniates of lead, pearl spar, granular white earthy fluor.
Beer Ferris.—Fluor, of several varieties, in the mines.
Bovy Heathfield, Devon.—Large crystals of schorl, apatite; pipeclay; Bovey coal.
Buckfastleigh.—Arragonite.
Bovey Tracey.—Apatite in large greyish-white translucent prisms, with crystallized tourmaline, in a quarry of red granite; retin asphalt adhering to brown coal; bituminous wood, or fibrous brown coal.
Babbicombe Bay.—In veins in the limestone, heavy spar.
Blackdown, Tavistock.—Pale rose-red manganese.
Blackdown Cliffs, near Collumpton.—A porous fine-grained sandstone, in considerable repute, is found here, and well known by the name of Devonshire batts; ligniform quartz.
Chudleigh.—Apatite; resinous bitumen.
Dartmoor.—Andalusite, in mica-slate and granite; common actynolite; stream tin rolled in garnet, with tourmaline; micaceous iron ore.
Dodscomb Leigh.—Crystallized grey oxide of manganese; red jasper.
Gunnis Lake, Plymouth.—Phosphate of copper crystallized; red oxide of copper; sulphate of copper; arseniate of copper.
Ilfracombe.—Arragonite.
Moulton, North, in the refuse of the Prince Regent Mine (in the parish of).—Native gold.
Sidmouth, in the hollow, flints near.—Fine mamillated calcedony. In the new red sandstone on the coast, sulphate of strontian occurs. Chlorite marl, under the marly rocks; limestone, that bears resemblance to chalk, at Salcombe.
Wear Gifford.—Pipeclay.
Torbay.—The cliffs near Mary Church contain a variety of marbles, superior in beauty to any in this country.

Moulton, South.—Black marble quarries.

Tavistock.—Common magnetic iron ore; iron mica; grey tetrahedral copper pyrites; micaceous specular iron ore. And in the neighbourhood Devonshire oilstone is found, of an excellent variety, for sharpening all kinds of thin-edged broad instruments, as plane-irons, chissels, &c., and deserves to be better known. First brought into notice by Mr. John Taylor.

Totness, near.—In masses of brownish-red ochry clay, in irregular nodules, specular iron ore occurs.

Teignmouth.—Slaty clay; pipeclay.

Upton Pyne, 3½ miles west of Exeter.—Compact grey manganese ore; ironstone and basalt.

Ugbrooke Park, near Chudleigh.—Umber.

Sampford, near.—Cobalt ore.

Tor Point, south side of Lynher Creek, is a quarry of greenstone, near the ferry.

Peter Point.—A bed of greenstone occurs here.

Willsworthy Mine.—Native silver, with yellow copper, and arsenical cobalt.

Exeter, near.—Manganese.

Newton, St. Cyres.—Ironstone and basalt.

DERBYSHIRE.

Ashford, two miles N.W. by W. from Bakewell.—Lucullite.

Bakewell.—Tripoli; rottenstone; barytes.

Buxton.—Fetid heavy spar; hepatite.

Bredon Hill.—Magnesian limestone.

Castletown.—Mawtor, in the lead-mine called *Odin*, in a vein of which is elastic mineral pitch; and in the shale which overhangs are accurately defined rhomboidal crystals of sulphate of iron.

Cromford Level, near Matlock.—Corneous lead, or muriate of lead (very rare).

Matlock.—Lucullite; fibrous gypsum; stalactites.

Monsaldale.—Ditto.

Pool's Hole.—Stalactites.

Redland, near Buxton.—Sulphate of barytes; sulphate of strontian.

Derby, near.—Quartz pebbles; hæmatite, or bloodstone; magnesian limestone.

Ricklow, Highlow, near Moneyash.—Varieties of marble.

Buxton, near.—Sulphate of barytes; crystals, called Buxton diamonds.

Chellaston, near Derby.—Selenite; fibrous gypsum.

Castleton.—Stellated stalactite; varieties of fluor; selenites; crystals; sulphur; asphaltum; slickensides; cyalen; elastic bitumen; yellow ochre; calcsinter; massive fluor.

Waterhall Cavern.—Cobalt ore; varieties of fossils.

Ryam.—Amber-coloured spar; barytes; arsenical pyrites; lead; calamine.

Rutland Mine.—Cupriferous calamine.

Cumberland Mine.—Gypsum.

Masson Hill.—Quartz; lead ore; calamine.

Dimple Mine.—Lead ore.

Wirksworth.—Dark brown stalactite; white barytes; earthy carbonate of lead, and varieties of lead ores; blende.

Elton, near Winster.—Black wad.

Ashover, near.—Double refracting spar; yellow fluor; galena; slickensides.

Swanwick, near Alfreton.—Pyrites in coal; ironstone; on the common a red clay used to colour deal so as to resemble mahogany.

DORSETSHIRE.

Handfast Point, to beyond Corfe Castle.—An extensive stratum of pipe-clay lies in a horizontal position above the chalk between these two places.

Lyme.—Fibrous limestone in lias.

Osmanton Mill, five miles east of Weymouth.—On the shore, arragonite occurs at.

Hunger Hill, near Wareham.—Pipeclay.

Wareham, Morden.—Firestone, of an iron colour.

Purbeck, Isle of.—Paving-stone, called Purbeck stone; white limestone, without shells; brown limestone, with shells; a stone that splits, used for tiling.

Dunshay.—Coarse marble, of various colours.

Kimridge.—Alum-mines and fossil coal, or argillaceous slate.

Portland Island.—Freestone, called Portland stone; topaz-coloured carbonate of lime, called sugarcandy-stone. In many of the quarries are found a variety of fossils; and upon *Chesil Bank* pebbles of quartz, jasper, chert, and white calcareous pebbles, called Portland pebbles.

DURHAM.

Alonhead.—Green lead spar; phosphate of lead; carbonate of lead, or white lead spar.

Arkendale, Durham, four miles north-east Knaresborough.—Witherite.

Building Hill, Sunderland.—Prismatic lucullite, or madreporite, in brown dolomite; swinestone.

Breckensyke Mine.—Earthy fluor, with partially decomposed galena.

Welhope.—Witherite.

Dufton.—Witherite.

Fair Hill.—Black lead spar.

Flow Edge.—Ditto.

Grasshill.—Green lead spar; phosphate of lead.

(Ditto.—Chapel ?)

Grassfield, near Neuthead.—Earthy carbonate of lead.

Gateshead.—Upon the *Fell* are grindstone quarries. Firestone in various parts of the county.

Hartlepool.—Swinestone.

Lufton Hill Pit, near Durham, or Lumton Hill Pit, six miles south-west Crockfield.—Arragonite.

Marsden Rock, Sunderland.—In horizontal beds, flexible magnesian limestone.

Sunderland.—Oviform, or globular limestone; agaric mineral; coal-mines; botryoidal limestone, or swinestone, called Building-hill stone.

Teesdale.—Green lead spar; phosphate of lead; white lead; spar, or carbonate of lead; augite in basalt, with olivin; chrysolite.
Wolsingham, six miles south-east by east from Stanhope.—A beautiful black spotted limestone; and near, are millstone quarries.
South Shields.—Salt-works.

ESSEX.

The only minerals this county contains are flint, chalk, blue, red, and white clays; in the latter, iron pyrites are sometimes found. Upon the sea-shore, between Little Holland and Harwich, copper pyrites and selenite, called there Frinton glass, from being most plentiful opposite that village. Many fossil shells are found in the cliffs of Harwich and Walton. The chalk-pits of Purfleet and adjoining villages produce a variety of echini.
Woodford.—Striped flints.

GLOUCESTERSHIRE.

Stroud.—Porous, or tufaceous limestone.
Woodford Bridge, near Berkeley.—In a low basaltic rock of brown amygdaloidal wacké, prehnite occurs, embedded in globular concretions of considerable size, mixed with green earth and calcareous spar.
Aust Passage.—Foliated celestine, or sulphate of strontian.
Dressing Green, near Tortworth (Lord Ducie's).—Riband agate of great beauty.
Berkeley.—In a basaltic rock, agate; compact sulphate of strontian.
Dean, Forest of.—Red hæmatite.
Frenchay, near Bristol.—A vein of coal occurs a quarter of an inch thick in the solid rock.
Leigh, near Bristol.—Manganese in thin veins.
Micklewood, in "The Old Rock."—Nodules of decomposing granite.
Pill Landing Place, near Bristol.—Amygdaloidal, or plum-pudding-stone, affording occasionally fluor.
Durdham Down, near Bristol.—Lead combined with barytes, in considerable quantities; veins and nodules of greyish flint, in the limestone rock; oolitic limestone; the ore exceedingly distinct and equal.
On the Railway, from Coal-Pit Heath to the River.—Strontian in lias.
Bilton, Iron Acton, and Stone.—Iron ore.
Awre, Westney, and Trethern Cliffs.—Iron pyrites.
Forest of Dean.—Coal.
Clifton.—Quartz crystals.
Cotwold.—Freestone.
Cotham.—Marble, called picturesque or landscape marble.
Frampton Cotterel.—Gritstone.

HAMPSHIRE.

Kimmeridge.—Brown bituminous shale.
Hordwell.—In the clay cliffs between *Lymington* and *Christchurch*, nodules of iron ore, with flints and pebbles.

ISLE OF WIGHT.

This island, so very interesting in its geological character, from the

variety and arrangements of its different formations in so small a space, does not present any peculiar treasures in a strictly mineralogical view, from the nature of those formations, which are of the most recent order, the oldest being the iron sand.

Alum Bay.—Selenite, in the London, and five or six seams of lignite in the plastic clay.

Appuldurcombe Park.—Calcareous spar.

Brook, on the South Side.—In the iron sand, lignite occurs in large quantities, frequently covered over with bright crystals of iron pyrites.

Headon Hill.—White disintegrated pebbles, found in the sands in the plastic clay formation, much resembling spongiform quartz, and at the bottom of the hill there is a bed of surturbrand, and under this a bed of pure sand of dazzling whiteness, much used in the manufacture of glass.

Nortin, near Yarmouth.—Amber is found on the shore here.

Sandown Bay, east side of the Island.—In the iron sand many varieties of pyrites. On the shore are many curious pebbles, mottled or clouded with various tints, having the appearance of Egyptian pebbles, susceptible of a good polish, and much resembling agate.

Undercliff.—Chert in green sand; calcedony; quartz crystals.

Ventnor Cove.—Calcareous tufa.

Bembridge.—Coal; fullers'-earth; red ochre.

Quarr Abbey.—Freestone.

On the South Shore.—Copper pyrites.

HEREFORDSHIRE.

Snodhill Castle.—Limestone.

Stoke.—Fullers'-earth.

Ledbury.—Marble.

Herefordshire Beacon, at the foot of the, two miles from Ledbury.—Red hæmatite; red felspar; quartz.

Holybush Hill, three miles south-east from Ledbury.—Gneiss; sandstone; granular quartz; hornblende; steatite.

Swinnit Hill, three miles east by south from Ledbury.—Quartzose sandstone, containing mica and fossil impressions.

In a lane leading from Colwall Green to Wych, four miles from Ledbury.—Argillaceous rock, containing varieties of madrepore.

Eventon, two and a half miles north-east from Ledbury.—Large limestone quarries, containing calcareous spar, with red sulphate of barytes, and many shells.

HERTFORDSHIRE.

Alban's, St.—Pudding-stone.

HUNTINGDONSHIRE.

There are no minerals peculiar to this county; the soil is composed of calcareous clay, loam, and gravel. Fossils of the Echinus, &c. are found in the gravel-pits near St. Ives.

KENT.

Deptling, near Maidstone.—Fullers'-earth.

Folkestone.—Chert in green sand; pseudo-morphous iron pyrites.
Maidstone, near, in the Parish of Boxley.—Fullers'-earth.
Bethersden.—Marble quarries.
Otham near Maidstone.—Large sand-pits.
Sheppy Island.—Sulphate of barytes.
Woolwich and Plumstead.—Varieties of fossil shells.

LANCASHIRE.

Anglesark.—Witherite, in a vein of galena, with heavy spar (near *Chorley*).
Oldham.—Siliciferous sub-sulphate of alumine.
Ormskirk.—Petroleum.
Seacome Ferry.—Iserine.
Toxteth, near Liverpool.—In river mud, earthy phosphate of iron, or blue iron ore.
Ulverstone.—Scaly red iron ore, or red iron froth; compact red iron ore; fibrous red iron ore, or red hæmatite; earthy hæmatite.
Wigan.—Cannel coal.
Dalton, near.—Mesotype; iron ore.
Staunton, five miles from Ulverstone.—Hæmatitic iron ore.
Silverstein.—Red hæmatitic iron ore.
Hawkshead.—Blue slate.
Conistone.—Novaculite.
Chorley Forest.—Honestone.
Haigh, near Wigan.—Cannel coal.
Wigan, near.—Bituminous coal with shells.
Holland, near Wigan.—Flags and grey slate.
Lancaster.—Freestone quarries.
Leigh and Ardwick, near Manchester.—Limestone of a peculiar character.
Rainford.—Scythe-stones.

LEICESTERSHIRE.

Ashby de la Zouch, near.—Iron flint.
Charnwood Forest.—Coal and lime; flinty slate; hornblende, as a constituent part of syenite and greenstone. Charnley Forest stone is one of the best substitutes for Turkey oilstone, and is much in request by joiners and others for giving a fine edge.
Sorrel, Mount.—Here is a low range of granite.
Barrow, one mile from Mount Sorrel.—The limestone here, rich in the remains of the ichthyosaurus and other fossils.

LINCOLNSHIRE.

A species of variegated spotted marble is found near *Stratton*, between *Lincoln* and *Gainsborough*.
Lincoln, one mile from.—Building-stone quarries.
Holbeach, near.—Sandstone rocks.
Belvoir Castle, near.—Cornu-ammonia, and other fossils.

MIDDLESEX.

Highgate.—Fossil copal, in the bed of blue clay.*
Dogs, Isle of.—Earthy phosphate of iron.
Kensington Gravel-pit.—Yellow amber.
Sheppy, Isle of.—Radiated iron pyrites; selenite; and on west side septaria, with heavy spar; and in the blue clay of this island, spheroidal argillo-ferruginous limestone.

MONMOUTHSHIRE.

Gold Cliff, four miles south by east from Newport.—Stratifications of limestone and silicious crystallizations, with pyrites; and beneath is an immense bed of mica.
Blaenavon Mountain.—Iron ore.
Blovenge Ditto.—Ditto.
Cefn Pwlldu Hill.—Lead.

NOTTINGHAM.

Clifton, near Nottingham.—White translucent fibrous gypsum.
Nottingham, near.—Fullers'-earth, in lumps, in the red marl.
Mansfield.—Coal, quarries of reddish stone.
Wordhouse.—Limestone.
Maplewick.—Building-stone.
Gotham, Beacon Hill.—Alabaster, or gypsum.
Wollerton.—Plant-formed coal.

NORFOLK.

Hustanton.—Titaniferous iron-sand.
Amber is frequently thrown up by the sea on the coast of this county.†
Mousehold Heath.—Variegated flint pebbles.

NORTHAMPTONSHIRE.

Badby, near Daventry, Great Weldon, near Rockingham.—Ragstone.
Harlestone, four miles from Northampton.—Blue ditto.
Barnack, near Stamford.—Building limestone.
Thingdon, near Wellingborough.—Yellow and purple ochre.
Clipston, near Market Harborough.—Red ochre.
East Farndon, near Harborough.—Slaty clay.
Northampton Field, in the eastern part of.—Pipe-clay.
Adstone, seven miles from Towcester.—Marly clay.
Calverton.—Inferior roofing-slate.

NORTHUMBERLAND.

Allenheads.—Rock crystal fourteen miles S.S.W. *Hexham;* lead ore; calamine; ironstone.
Caldew, in granite, near the source of the.—Molybdena.

* Fragments of fossil gum were found near London in digging the tunnel through the London clay at Highgate.—*Buckland.*
† The beautiful amber which is found on the eastern shores of England, and on the coasts of Prussia and Sicily, and which is supposed to be fossil resin, is derived from beds of lignite in tertiary strata.—*Buckland.*

Hesket, Newmarket (fourteen miles S.S.W. Carlisle), four miles south-west of.—Molybdena.
Newcastle.—Black coal; in grey sandstone, wavellite; limestone.
Walker, in Long Benton Parish.—Basalt.
Coalclough Mines.—Blende.
Eglingham.—Pyrites.
Fallow Field, in St. John Lee.—Lead ore.
Houghton near Bamborough.—Ironstone.

OXFORDSHIRE.

Oxford, north side of, between the Rivers Isis and Cherwell.—Agaric mineral, or rock-milk, a pure carbonate of lime.
Shotover Hill.—Ochry-brown iron ore; yellow ochre; selenite in blue clay; fibrous and incrusting carbonate of lime.
Stonesfield.—Calcareous schist.
Headington.—Freestone; ragstone.
Summerton.—Tufa.
Horaton.—Firestone.
Blackington.—Grey marble.
Banbury.—Pyrites.
Nettlebed.—Red earth.

RUTLANDSHIRE.

Ketton.—Freestone.
Lynden.—Talc.
Limestone with organic remains in the north part of this county.

SHROPSHIRE.

Brosely.—Cannel coal four miles east of Wenlock.
Billingsley.—Jaspery iron ore.
Bental Edge, the cliffs at,—on the opposite side of the river, contain many fine specimens of crystallised lime, particularly a flesh-coloured tabular spar, sprinkled with iron pyrites, and resembling the sulphate of barytes.
Coalbrook Dale.—Reniform, or kidney-shaped brown clay iron ore; indurated clay.
Coal Port, Coalbrook Dale.—Petroleum.
Clee Hill.—Cannel coal.
Haughmond Hill.—Asphaltum occurs in veins, and slaggy mineral pitch.
Hawkeston and Pym Hill.—Freestone rocks tinged with green carbonate of copper.
Llanymynich Hill, six miles south by west Oswestry.—Indurated red copper or tile ore; between the strata of lime, tenacious smooth clay, orange-coloured ochre, and green plumose carbonate of copper or malachite; beautiful specimens of stalactites.
Lincoln Hill.—Petroleum.
Madely, fifteen miles south-west Salop.—Mineral oil, petroleum, porcelain jasper, porcellanite.
Pitchford, 6¼ miles south Salop.—Mineral oil or petroleum, not uncommon filling cavities and cracks in shell limestone.

Snailbach.—White lead spar, or carbonate of lead, and witherite embedded in heavy spar; rhomboidal and dog-tooth spar, the former covered with pyramidical quartz crystals, and overspread with iron pyrites, and very minute needles of dog-tooth spar. The ores at this mine are,—

1. Sulphuret of lead, both galena and steel ore.
2. Carbonate of lead crystallised.
3. Red lead ore.*
4. Blende, or black jack.

Much Wenlock, Brosley, Madely, Pitchford.—Coal.

Most of the coal-pits have an upper stratum of blackish stone, porous and full of a bituminous matter, which is manufactured into a sort of pitch or tar.

Shiffnal, north of.—Sandstone.

Ketley, near Shiffnal.—Columnar iron ore.

Longmont Hills.—Shivery schistus.

Stiperstones Hill, between Shrewsbury and Bishop's Castle.—Large blocks of quartz on the top of.

SOMERSETSHIRE.

Watchet.—Sulphate of strontian.

Bristol.—Micaceous specular iron ore; red hæmatite.

Bath.—There is a most elegant form of carbonate of lime, which sometimes, though rarely, is found within one of the fossil terebratulæ of the upper oolite. It assumes the appearance of a delicate cotton, and from its minuteness as well as peculiar locality (within the shell) has not probably been yet noticed. There is also a beautiful efflorescence now and then observable on the limestone, perhaps arising from decomposition.

Bedminster Bridge, about a hundred yards above.—Strontian may be seen at low water, in veins of five or six inches in thickness.

Brandon Hill, near Bristol.—Very hard amygdaloid.

Mendip.—Manganese, in thin veins.

Oldown, Bath.—Fullers'-earth mixed with shells, between the upper and lower oolite.

Shipham, three miles north-east by north from Axbridge, and near Cross.—Earthy calamine.

Westbury, near.—Southmead lead combined with calamine, in large nodules.

Collier's Lane, Bath.—Strontian in inferior oolite.

Downsend, near Bristol.—Botryodice; oxide of iron.

Clifton Hill.—Amethystine quartz.

Bristol, near.—Variety of jasper or iron-flint.

Bristleton, near Bristol.—Coal.

Old Clive.—Alabaster.

Great Chew, near Wrinton.—Red ochre.

STAFFORDSHIRE.

Birch Hill, near Walsall.—Anthracite.

* Discovered by Raspe, a German mineralogist.

Ecton, near Leek.—Octohedral copper pyrites; dog-tooth calcareous spar; lead ore; slackensides; cauk.
Ponck Hill.—Crystallized prehnite, with mesotype embedded in sulphate of barytes.
Rowley Hills.—Basalt.
Walsall Hill, Birch Hill, near.—Anthracite.
Tipton, Bilston, Newcastle, west of.—Iron ore.
Wednesbury.—Hæmatite.
Mixon, near Leek.—Copper ore.
Dudley Castle.—Limestone.
Dudley.—Sand, for casting metals.
Cheadle, near.—Coal.
Hanley Green, two miles north-west of Newcastle.—Peacock coal.
Longdon.—Cannel coal.
Tixall, Wrottesley, Pendeford.—Freestone.
Yelpesley Tor.—Variety of marble.
Hansop.—Grey marble.
Powke Hill.—Black marble.
Tutbury.—Alabaster.
Langley Close.—Black chalk in the beds of grey marble.
Himley Green.—Red earth, under a rock near.
Newcastle, near.—Potter's clay.
King's Swinford, Amblecote.—Clay for the glass-houses.

SUFFOLK.

Lowestoff sea-shore.—Amber; jet.
Woolpit.—White brick-earth, of a superior quality.
Woodbridge, in pits, south of, and at.
Orford.—Coralliform carbonate of lime.
Clare.—Fossils in the clay.

SURREY.

Dorking.—Radiated pyrites; limestone.
Nutfield, near Reigate.—Amorphous crystallized sulphate of barytes; woodstone; fullers'-earth.
Godstone.—Freestone, firestone.
Merstham.—Firestone.
Bleckingly.—Fullers'-earth; ragstone.
Haselmere, Dunsford, Cranby.—Iron ore.

SUSSEX.

Alfriston Chalk Pit.—Yellow semi-transparent columnar crystals of carbonate of lime, and pearl-white obtuse rhomboidal crystals of the same.
Beachy Head.—Columnar crystals of carbonate of lime and small cylindrical masses of pyrites of a steel-grey colour.
Bexhill.—Fibrous lignite or Bovey coal.
Chilley, near Pevensey.—Sandstone impregnated with bitumen.
Little.—Grey, white, ferruginous, and fawn-coloured sand, sandstone, with abundance of small portions lignite.

Matting Hill, in quarries at the foot of.—Crystals of sulphuret of iron of a reddish or yellowish-brown colour.
Gruffham, near Midhurst.—Red ochre.
Chedham, five miles west of Chichester.—Red ochre.
Forrest Row, Sheffield Green.—Freestone.
Hamwell Bridge.—Quartz pebbles in sandstone.
Hamsey.—In chalk marl, lightish-grey semi-diaphanous crystallised carbonate of lime; the usual form of the crystal is that of an acute rhomboid; crystals of pyrites and oxide of iron, in the state of a reddish-brown powder, are frequent in cavities in marl.
Kirdford, 4½ miles from Petworth.—A variety of marble.
Bracklesham Bay.—Shell-formed carbonate of lime.
Newhaven.—Aluminite, or native argil, filling up fissures in the chalk; selenite.
Newick Old Park.—Fibrous liguite, or Bovey coal, about a mile from the banks of the *Lewes Canal.*
Ouse River, at the mouth of.—Bituminous wood, or fibrous brown coal.
Rottingdean.—A vein of ironstone in the cliffs.
Tillington, 1¾ miles from Petworth.—Fullers'-earth.
Plumpton Plain.—Rhomboidal crystals of carbonate of lime in cavities in the chalk immediately beneath the turf.
Penshurst, near Battle.—Ironstone.
Piddinghoe.—In a chalk-pit by the road-side, chalk of great purity.
Petworth, near.—Fullers'-earth.
Steyning, near, at Wapping-thorn Hill.—Septaria of argillaceous limestone.
Southeram, near Lewes.—In chalk marl, slaty clay; in chalk, green sandstone or chlorite sand.
Waldron.—Fibrous lignite, Bovey coal, or cannel coal, on the banks of a rivulet which separates that parish from *Heathfield*, near *Geer's Wood.*

WARWICKSHIRE.

Harthill, near Atherstone.—Crystallized grey oxide of manganese.
Bedworth Nuneaton.—Coal.
Bidford, Wilmecote.—Blue flagstone.

WILTSHIRE.

Box, Swindon.—Freestone quarries.
Tisbury, four miles south of Hindon.—Coralliform flints.
Fonthill.—Shelly-formed calcedony, flinty roe-stone.
Polton, three miles from Fairford.—Plant-formed coral.

WESTMORELAND.

Burton.—Pale-blue sulphate of strontian.
Caldbeck Fell, near Keswick.—Tugsten, in beautiful crystals, associated with apatite, molybdena, and woolfram, in quartz; phosphate of lead; sulphuret of bismuth.
Keswick, Gold Scoop Mine.—Yellow copper, said to contain much gold.
Merton Fell.—Witherite.

Newlands, Vale of, five miles south-west by west of Keswick.—Conchoidal copper-green chrysocolla, along with olivenite.
Shap.—Large crystals of dark-red felspar, in the porphyritic granite.
Keswick, near Wolscrag.—Chiastolite in small acicular crystals, in clay-slate.
Bolton Common.—Rock marl.
Acom-bank, one mile from Temple Sowerby.—Gypsum.
Shap Abbey, near, and a little below Knipe.—Limestone, freestone.
Shap, between, and Kendal, on the Demmings.—Red porphyry.
Wastdale Crag, near Kendal.—Flesh-coloured granite, containing quartz and felspar larger than common.
Wastdale Crag, near Wastdale Head House.—Large blocks of rounded granite.
Patterdale Chapel, south of.—Basalt.
Kendal Fell.—Grey schistus.
Wallow Crag, Keswick.—Epidote, or pistacite, in veins, in quartz.
Ambleside, Kent Mere.—Slate.
Ambleside and Penrith, between.—Marble.
Shap, near Stainmoor Forest.—Coal.
Knipe Scar.—Fibrous talc.
Dufton, 3¼ miles north from Appleby.—Flos ferri; globular carbonate of barytes.
Kendal Fell.—Coral, like carbonate of lime.
Wastel Head, Ashby.—Copper.
Hartley, Dufton, Dunfell Mines, and Greenfell Mines.—Lead.
Dunfell Mines.—Ironstone.
Shap, near.—Ditto.

WORCESTERSHIRE.

Geological Summary.

The central parts of this county are occupied by new red sandstone. On the south-east and south are the oolitic hills of *Broadway* and *Bredon*, with an extensive plain of lias at their base. On the west is the syenitic range of *Malvern*, which is prolonged by the transition hills of *Old Storridge* and *Abberley*, towards *Bewdley*. In the north-west is the coal-field of *Wyre Forest*. On the north is *Bromsgrove Lickey*, composed of new red conglomerate, and beyond this is the *Dudley Coal-field*, exhibiting occasional outbreaks of transition and igneous rocks.

Droitwich, and at Stoke Prior, near, are the pits of rock-salt, at both which places about 45,000 tons of salt are annually produced. At the former place the saccharine gypsum occurs in red marl.
Hadbury.—Saccharine gypsum.
Dudley.—Porcelain jasper.
Licky Hill, near Birmingham.—A remarkable mass of quartzose sandstone.
Malvern Hills, in the syenite of the,—Epidote, or pistacite, occurs embedded and forming small veins, and common hornblende and felspar.
Stourbridge.—Indurated clay, interposed between layers of coal.
Overbury.—Freestone.
Rowley Hills.—Toadstone.

Whitley, Abberley Hills.—Limestone.
Dudley.—Lenticular carbonate of lime.
Littleton.—Calcareous ragstone.
Droitwich.—Alabaster; talc.
Malvern Hills, east side, opposite the Worcester Beacon.—Red argillaceous sandstone; white quartzose sandstone.
Malvern Hills.—Hornblende; felspar; quartz; mica.

YORKSHIRE.

Athercliff, near Sheffield.—Cannel coal.
Craven.—Native minium; red oxide of lead.
Ferrybridge.—Massive gypsum.
Grassington Moor.—Native minium, or red oxide of lead; compact carbonate of lead; galena; calamine.
Grass Hill Chapel.—Ditto, ditto.
Ingleborough.—Lucullite.
Knaresborough, on the banks of the Nidd.—Celestine.
Middleton Tyas, 5½ miles N. E. Richmond.—Foliated copper glance.
Nithisdale.—Green lead spar; phosphate of lead.
Nidd, on the banks of the, near Knaresborough.—Sulphate of strontian occurs.
Arkendale.—Sulphate and carbonate of barytes.
Halifax.—Iron pyrites, with shells.
York, near.—Red jasper.
Ingleton.—Dentrical slate.
Roche Abbey.—Magnesian limestone, called Rock Abbey stone.
Ingleborough.—Schistose talc.
Nid River, Knaresborough.—Sulphate of strontian.
Roseberry Topping Mountain, near Newton, four miles from Gisborough.—Iron ore.
Gisborough.—Alum rock.
Richmond.—Lead ore.
Swaledale.—Lead-mines.
Middleton Tyas, near.—Copper.
Ayton, six miles from Scarborough, and near Whitby.—Ironstone.
Whitby.—Sulphate of iron; alum; red iron ore; jet embedded in aluminous shale. Here is the oldest alum-work in this country, the vast deposit of alum slate being about twenty-nine miles broad, from north to south, and stretching from the eastern coast, even into Lancashire.
Windale.—Native minium; red oxide of lead.
Yordas Cave, near Ingelton.—Stalactite.
Gatherly Moor, near Richmond.—Freestone.
Renton.—Freestone.
N.W. extremity of the North Riding.—Light-red granite.
Easingwold and Thirsk, between.—Coal.
Roseberry Topping, side of, near Newton.—Jet.
Scarborough, in veins, between the rocks near.—Jet; pyrites of different sorts; spar.

NORTH AND SOUTH WALES.

ANGLESEA.

Amlwch.—Steatite.

Pary's Mine.—1. Yellow sulphuret of copper; 2. Black copper ore; 3. Malachite; 4. Native copper; 5. Sulphate of copper; 6. Sulphate of lead; 7. Native silver.

Floatstone; pyrites; sulphate of iron.

Holyhead, and Cymlin Bay.—Green magnesian slate.

Rhos Collin, near.—Green amianthus, in green marble.

Dulas Bay, near, thirteen miles north-west of Beaumaris.—Red ochre.

Cemlyn, three miles east from.—Red and blue ochre.

Maldrath Creek, near, four miles south-east of Aberfraw.—Freestone; serpentine coal.

Bullock's Quarry, six miles from the Pary's Mine.—Beautiful red and green serpentine.

BRECKNOCKSHIRE.

Langoe Pool, near Brecon.—Agaric mineral.

Abercynrig, near Brecknock and Ffrwdrech.—Limestone.

Dinas Rock, near Pont Neath, Vaughan.—Fire-clay.

Dinas Rock, Coed Cymmer.—Lead.

CAERMARTHENSHIRE.

Langharne, near.—Limestone.

Llangyndein.—Marble quarries.

Llanelly.—Coking coal; iron ore.

Rhandier-yr-Abbad, six miles from Llandovery.—Lead.

CAERNARVONSHIRE.

Beddgelert.—Native oxide of titanium.

Conway.—Steatitic clay occurs in nodules in a hard cellular hornstone, forming large mountainous masses.

Elion Moel, near.—Compact magnetic pyrites.

Glydu Bach.—Agalmatolite.

Llandidno.—Foliated copper glance; fibrous malachite.

Llangynnog.—Lead; calamine.

Llanberris.—Yellow sulphuret of copper; and between this place and Caernarvon, very beautiful varieties of klingstein occur in rock masses.

Moel Elion Llanrwst, at the base of.—Magnetic iron pyrites.

Carnedd Llewelyn, in the Llanchid Parish, at the base.—Chert; quartz.

Dolawyr Slate Quarries, in the rocks near.—Copper ore; molybdena; steatite; honestone.

Pwll-y-cochar, near Conway.—Red crystallized carbonate of lime.

Dolbadern Llanberris.—Slate.

Kilgwyr, in Llanlyfni.—Slate.

Cwm Idwal.—Novaculite; the Welsh oilstone met with here is generally harder, but in other respects differs but little as a whetstone from that of *Charnley Forest*; but in consequence of its being more expensive, is in less general use.

Caradoc Caer, in globular concretions in the amygdaloid of.—The glassy variety of actynolite.
Snowdon.—In rock crystals, capillary titanite. With rock crystals, adularian brookite.
Trifriew, near Vale of Conway.—Magnetic pyrites forming a large bed with black calcareous spar in transition slate.
Menai.—Hornstone; forming beds in limestone in the bank of.
Orme's Head.—Green and blue carbonates of copper.
Braunspath in veins with copper and manganese, and also very abundantly in mass.
Black copper in limestone, with copper pyrites; malachite; calcareous spar; and pearl spar.
Pwllhelli.—Black chalk.
Moel Shabot, near Penmanmaur.—Augite occurs interspersed in a substance resembling steatite in the summit rocks.
Pont-abu-glarslyn.—Yellow sulphuret of copper; and a little to the south of, disseminated in transition greenstone; magnetical pyrites.

CARDIGANSHIRE.

Darren-favor Mine, and Llanfair, near the river Teivi.—Silver; lead; quartz; spar.
Esgair Vraith.—Copper ore.
Tuys Cynoelin Mine.—Copper.
Cwm Ystwyth, Llewernog, Nant-y-Crier.—Lead ore and quartz.
Lisburne Mines, near Aberystwyth.—Galena; blende; quartz.

DENBIGHSHIRE.

Asaph, St.—Witherite.
Mold and Llandegla.—Lead ore; limestone.
Rhuabon Hills and Bromber, near Wrexham.—Iron ore.
Pont Cyssilte, near.—Iron pyrites.
Rhuabon and Wrexham, between.—Coal.
Llangynnog, Cader Ferwyn, Syllalin.—Slate.
Llangollen, near.—Limestone.
Coed Marchan, near Rutheir.—Red and white marble quarries.

FLINTSHIRE.

Caergwole.—Limestone.
Holywell, near Whiteford.—Chert; cubic lead ore; calamine; blende.
Mostyn, near Whiteford.—Coal.
Pont-y Pwll-dwr on Halkin Mountain.—Lead ore.
Kilken.—Lead ore.
Golch Rake, near Holywell.—Lead.
Rhos Esmor.—Freestone.
Holywell.—Double-reflecting spar.
Mostyn, near Bichton.—Petroleum.
Holywell.—Sulphate of zinc; earthy calamine.
Whiteford.—Bituminous limestone.

GLAMORGANSHIRE.

Aberthaw.—Limestone.
Barry Island.—Celestine.

Merthyr Tydvil, in the ironstone of.—Hatchetine; common argillaceous ironstone; coal.
Gower.—Lead; manganese; and hematitic iron ore are found in small veins in limestone.
Dunraven and Penarth, between.—Blue limestone.
Penarth, near.—Gypsum, in hard clay.

MERIONETHSHIRE.

Cader Idris.—Porphyry quartz.
Prince of Wales Mountain, near Dolgelly.—Copper ore.
Dinas Mowddwy.—Blue ochre.

MONTGOMERYSHIRE.

Pyslyll Rhaiader, Dylisan.—Lead ore.
Llangynnog.—Galena; slate.
Llanidloes.—Schistus; hornblende.
Plynlimmon.—Quartz.
Coedwae.—Coal.
Breidden Hills.—Clinkstone.
Serpentine, with green ferruginous and purple spots, occur near.
Llanymynech Hill.—Calamine; blende; limestone.

PEMBROKESHIRE.

Tinmouk Castle, near.—Yellowish-grey, cream-coloured flexible dolomite.
Llangrnach Parish.—Lead.
Milford Haven.—Copper in veins.
Tenby Bay, Coast of.—Ironstone.
Newport Slate Quarries.—Alum-veins.
Fishguard.—Puddingstone; freestone.

SCOTLAND.

ABERDEENSHIRE, OR MAR.

Ardonald, between Keith and Huntly.—Grenatite or staurolite occurs in clay-slate, accompanied with garnets, sappars, dolomite, spar, &c.
Mar and Cairngorm, in the granite and gneiss districts of.—In the upper part of the county common topaz, and likewise in alluvial soil, along with rock crystal, topaz, and beryl.
Aberdeen, near the Town of.—Grey manganese, in the granite, sphene.
Banchory.—Prismatic cyanite.
Call Hill.—Red stilbite.
Don.—In the bed of the river iserine, embedded in gneiss, and disseminated in granite along with iron-sand, and on the banks manganese.
the River.—Magnetic iron-sand.

Aberdeen, near.—Oxide of manganese; attica in granite; cairngorm; crystals; schorl; beryl; basaltic hornblende; hypersthene, or Labradore hornblende; oxide of titanium.

Money Musk.—Felspar; varieties of granite; iron ore, embedded in quartz, about a mile north-west of the church.

Huntley.—Garnets in the plum-pudding rocks; plumbago found at the junction of the rivers Bogie and Devernon; garnets found near the town.

Old Machar.—Manganese.

Leslie, Parish.—Greenish amianthus.

Devernon, on the Banks of.—Plumbago.

Craig in Strathbogie, near Aberdeen.—Green and white asbestus.

Braemar.—Slate; limestone.

Leith-hall, Kennethmont.—Marble quarry.

Towereef.—Asbestus.

Leslie.—Jasper; amianthus.

Deer.—Granite and felspar.

Kildrummie.—Rock cork.

Kinlock Rammoch.—Cairngorm; beryl; aqua marina.

Monattru.—Fluor spar, contained in a small vein of galena, which traverses granite.

Ben Avon.—Topaz.

Archindoor.—Red schorl, or andalusite, embedded in gneiss; freestone.

Tyre Bagger, near.—Asbestus; tremolite, in dolomite.

ARGYLSHIRE.

Ardnameuchan.—Pitch-stone occurs in trap rocks.

Inverary, in the syenite of,—Sphene; amianthus; and in the grounds of the *Duke of Argyle*, near *Inverary Castle.*—Chlorite slate is found remarkably well characterized.

Strontian.—Harmotome in galena occurs in gneiss; in syenite sphene; carbonate of *strontian* in veins that traverse gneiss, along with galena or lead glance, heavy spar, and calcareous spar.

In granite; precious garnet or almadine.

Stilbite, Easdale, Balachulish.—Slate quarries.

Ballachellish, one mile from Inverary.—Marble.

Strontian, on a hill near the mines.—Talc with garnets.

Ben Glos.—Pinite in porphyry; and in the rocks rutile.

Dalmally, in Lorn.—Lepidolite disseminated in foliates; and granular limestone.

Many of the women here and in the neighbourhood fasten their cloaks by a large silver brooch of a circular form, which is said to have been made long ago, of the silver found in the hills or procured from the lead of the country.

Glen Coe.—In the syenite, epidote.

Loch Tyne, opposite the Inn of Caindow, in.—Primitive limestone; in a quarry on the north side, lepidolite.

Corybury, on the mountain of, at the head of Loch Coeran.—Molybdena in six-sided tables, in quarts, in granite, with molybdena ochre.

AYRSHIRE.

Beith.—In trap rocks, fibrous prehnite.
Ballantrae, Girvan.—Shiller spar in serpentine.
Beith.—Fibrous tremolite.
Cummock.—In the coal formation, graphite embedded in greenstone, and in columnar glance coal; conchoidal glance coal; anthracite.
Kilmarnock—Ditto.
Cummock, New, about four miles from.—A bed of columnar glance coal, from three to six feet thick, in columns, arranged like basalt, and which is intermixed with compact, scaly, and columnar graphite.
Galston.—Pisiform clay ironstone; columnar glance coal, occurring along with greenstone, slate-clay, clay, ironstone, and bituminous shale.
Kirk Michael.—Coal; limestone; freestone.
Stair.—Whetstone, called Water-of-Ayr stone, used by cutlers; Stevenston sandstone, remarkably fine.
Beith.—Limestone.
Kyle.—Coal; limestone; ironstone.
New Cummock, on Lord Dumfries's ground.—Limestone.
Muirkirk, in Clydesdale.—Cannel coal.

BANFFSHIRE.

Boharm.—Prismatic cyanite; sapphire.
Glass, Parish of, near Huntley.—Common garnet.
Gartley Church, south of.—Slate quarry.
Gamrie, near Findon.—Petrifactions of fishes, plants, &c. are found embedded in lime nodules crystallized.
Macduff.—Transition granite at the *Longman Hill Quarry.*
Banff, Clay-slate, Greywacke, and near.—Amethystine sand of a beautiful colour is found, a fine object for the microscope.
Portsoy.—The rocks here consist of nearly vertical strata, ranging nearly north and west, and lying parallel to one another.
Primitive limestone; vast quantities of graphic granite of a red colour, containing crystals of schorl, tourmaline, and sometimes bryel, mica-slate; gneiss; hornblende rock traversed by granite veins surrounds the harbour of Portsoy. Serpentine, containing chromate of iron; magnetic iron ore; noble serpentine; asbestus; lepidolite; rock cork, mountain leather; wood asbestus; stellated asbestus; magnesite; steatite; diallage; amianthus, &c. &c., embedded in the serpentine rock.

BAMFSHIRE.

Portsoy, in the Vicinity of.—Greenstone; hypersthene; prismatic schiller spar, or anthophillite; blue felspar; ditto embedded in quartz; bronzite passing into serpentine; indurated talc with felspar; undulated or waved talc; talc slate, or calc spar; dog-tooth spar; porphoritic granite; plumose mica, felspar, and schorl; chlorite; jasper; green marble; black ditto; stratified ditto; rhomboidal lime; laminated mica; puddingstone; syenite; white graphic; andalusite; talc; acicular schorl; hornstone; porphyry; arragonite; mica; slate; sep- &c. &c.

Burn Hill.—Schistose quartz; serpentine.
Knock Hill.—Garnets in trap; plumbago; serpentine.
Keith.—Sulphuret of antimony; ditto fluor spar.
Banchory, Bothriprice.—Prismatic cyanite.

BERWICKSHIRE.

Sickar Point, in Cockburn's Path.—Schistus; sandstone.
Eymouth.—Puddingstone; granite.
Lamdie Craigs, in Home Parish.—Basaltic columns.
Mortoun.—Freestone.
Whitadder, in the red clay, on the Banks of the.—Fibrous gypsum.

CAITHNESS-SHIRE.

Stempster, in the Brook of.—Spar with a phosphoric quality.

CLACKMANNANSHIRE, OR KINROSS.

Loch Leven.—Lepidolite in primitive limestone, in a quarry on the east side, nearly opposite the Inn of *Balachulish*, situated on the west side.

DUMBARTONSHIRE.

Dunbar, in Trap Rocks at.—Iron-flint.
Frisky Hall, Cockney Burn, Old Kilpatrick, Loch Humphrey.—Fibrous prehnite.
Dumbarton, near.—In septaria, mineral pitch; prehnite.
Kilpatrick, Old.—Analcine occurs in secondary trap rocks with prehnite, needle zeolite, laumonite, and cross-stone; harmotome; mesotype.
Kilpatrick Hills, near Dumbarton.—These hills yield the best specimens of calcareous spar, zeolite, and prehnite.
Loch Humphrey.—Foliated and radiated zeolites; wavellite.
Luss.—Slate; freestone.
Kirkintilloch.—Coal; limestone; freestone; ironstone.
Loch Lomond.—Rhomb spar, embedded in chlorite slate; bitter spar, or spath; foliated brown spar.

DUMFRIESSHIRE.

Cummertrees, in the parish of.—Compact limestone cut and polished as marble.
Criffel.—In granite, zircon.
Cannoby, Sanquahar, Kirkconnel.—Black coal, in large quantities.
Eskdale Muir, and in the mountainous parts of this county.—Pitchstone rests upon transition rock, associated with secondary trap rocks.
Glendinning.—In veins that traverse transition rocks, accompanied with fine granular brown blende; iron pyrites; quartz; and calcareous spar; radiated grey antimony occurs.
Limeworth, near Arundle.—Coralliform limestone; called *Bengang and Aboyne* marble; eyed sandstone.
Middlebie.—Limestone; freestone, of a red colour.
New Cummock, four miles from.—Plumbago.

Moffat.—In greawacké, glossy alum; slate. In red sandstone, fibrous gypsum; octohedral alum; incrusting alum; slate chalybeate spring here, and *Hartfell Spa.*
Sanquahar.—Columnar glance coal.

EDINBURGHSHIRE, OR MID LOTHIAN.

Arthur's Seat.—Chrysolite.
Bass Rock, at the mouth of the *Frith of Forth*, is principally composed of clinkstone.
Bruton Quarry.—Cobalt blooms.
Castle Rock.—In basalt; tremolite.
Calton Hill, in the porphyritic rock of the.—Schiller spar occurs; and in trap rocks, slaty glance coal.
Craig Lockhart.—Schiller spar; dodecahedral quartz.
Calton Hill.—In trap tuff, foliated celestine.
Catherine's, St., Well.—Petroleum oozing out of the secondary rocks.
Castle Rock.—Asbestuous actynolite.
Salisbury Craig, Castle Rock, Arthur's Seat.—Fibrous prehnite.
Gilmerton.—Splent coal; cannel coal.
Moorfoot Hills.—Lydian stone.
Pentland Ditto.—Ditto; calcedony; jasper; compact felspar, associated with claystone, red sandstone, and conglomerate.
Portland Hills.—Striped jasper in claystone; porphyry.
Salisbury Craigs.—In veins and secondary greenstone, red and brown hæmatite.
Braid Hills, near Edinburgh.—Barytes; zeolite; specimens of copper ore and plumbago.
Craigmillar Hill, near Edinburgh.—Freestone; indurated clay.
Frith of Forth, on the shore of the.—Specimens of iron ore; jaspers; agates; schorl; zeolite; and in trap, celestine.

FIFESHIRE.

Burntisland.—In secondary greenstone, amethyst; rock crystal, and natrolite, in the hill named the *Bin.*
Dunfermline.—Anthracite.
Ely.—Pyrope in trap tuff; precious garnet, or almadine; ruby; hyacinth.
Inchcolm.—Amianthus; asbestus.
Starly Burn.—Cale tuff.
Duncarn Hill, Burntisland.—Basaltic columns.
Abbotshall, in the Quarry of Innertiel.—Coal; limestone with shells.
Wemyss's Castle, near.—Sandstone.
Abdie.—Granite quarries.
Dunfermline, near.—Coal; ironstone.

FORFARSHIRE.

Arbroath.—Mineral spring.
Bewie, between, and Stonehaven.—Foliated zeolite.
Forfar, near.—Red laumonite.
Balgray and Blackness, on the Hills of.—Porphyry and Scotch pebbles.
Glamis.—Grey slate.

Cortachie.—In the serpentine, schiller spar.
Montrose, in.—Amygdaloid; amethyst.

HADDINGTONSHIRE.

Fasney Burn.—Grey copper; and in small veins, along with heavy spar, in transition rocks, foliated copper glance.
North Berwick Law, Traprain Law, and the Girlestone Hills, afford many beautiful and highly characteristic varieties of clinkstone.
North Berwick.—Swinestone resting on red sandstone.
Tantallon Castle.—Mealy zeolite.
Dunbar.—Martial jasper.
Old Humstocks, six miles east of Dunbar.—Sandstone; ironstone; limestone; coal.
Innerwick.—Freestone.

INVERNESS-SHIRE.

Culloden, in the syenite of.—Sphene.
Drimnadrochit.—Serpentine.
Bilan Reach, in Glenelg.—Common actynolite.
Glenelg.—Asbestuous tremolite; amianthus; zoisite. In veins in mica-slate, asbestus; molybdena, embedded in chlorite slate along with actynolite. In white primitive limestone, tremolite. Asbestuous actynolite.
Glen Strath Farrar, near Beauley.—Compact graphite occurs in embedded masses, and disseminated in gneiss.
Inverness.—Serpentine; foliated celestine, in red sandstone.
Ben Nevis.—Fine porphyry; and in the syenite of sphene.
Kilmalie Parish, in Lochaber.—Elegant marble.
Loch Hourn, Banks of.—Prase.
Loch Ness, on the south side of.—In syenite, sphene.

KINCARDINESHIRE.

St. Cyrus, Parish of.—Fine jasper and pebbles are found here.
Arbuthnot.—Chalybeate springs are found in this parish.

KIRCUDBRIGHTSHIRE.

Criffle,—In the syenite of the, and other hills in this county, sphene occurs in small, and very small crystals.
Ferry Town of Cree.—Glossy alum-slate; octohedral alum.
Criffle Hill, Windy Shoulder Hill.—Common magnetic pyrites.
Kirbean.—Swinestone.

LANARKSHIRE.

Cambuslang, in the Parish of.—Compact limestone, cut and polished as marble.
Cumberhead.—Specular iron ore, with red and brown iron ore. In veins that traverse, sandstone, red hæmatite; and along with heavy spar, brown hæmatite; pitchstone.
Phillip's Hill Quarry.—Pyramidical spar.
Jackton.—Prismatic spar.
Kittochside.—Fibrous calcareous spar.

Tinto Hill.—Compact felspar; claystone.

Lead Hills.—Glossy alum-slate; radiated blue copper, accompanied with galena or lead glance; ochre of manganese; earthy lead spar; in plates in the lead-veins, rock cork; sparry ironstone; calamine; ochry-brown iron ore; brown hæmatite; iron pyrites; green lead spar; white lead spar; and lead vitriol, or sulphate of lead; black lead spar; friable earthy lead spar; common arragonite; copper nickel; and in the mining-field, native gold.

Glasgow, near.—Arragonite in cavities of basalt.

Wanlock Head.—Rock cork, in plates in the lead-veins; radiated blue copper; lead spar; green lead spar; friable earthy lead spar; prismatic calamine; foliated brown spar; nickel ochre.

LINLITHGOWSHIRE.

In the coal-field of this county, in a bed of limestone, in veins with nickel ochre, galena, brown blende, and heavy spar, copper nickel occurs.

Bathgate.—Limestone.

Barbaclaw, near Bathgate.—Coal; ironstone.

Uphall.—Fullers'-earth; red chalk.

West Craigs.—Anthracite.

MORAYSHIRE, OR ELGIN.

Freeburn and Aviemore.—In the syenite between, sphene.

Lossiemouth.—Lead ore, containing silver, is found to the west of the harbour, embedded in quartz.

Quarry Wood.—In the sandstone here, are found fullers'-earth, heavy spar, and manganese.

PEEBLESSHIRE.

Linton, Kirkurd.—Mineral springs.

La Mancha, near Linton.—Veins of iron ore and alum-slate.

Bridgehouse, Parish of Linton.—Limestone with freestone; shell marl; and fullers'-earth.

Newland's Parish.—Varieties of minerals.

PERTHSHIRE.

Ben More.—Micaceous specular iron ore.

Ben Lawers.—Chlorite slate.

Craig Cailleach, near Killin (*Perthshire*).—Rutile embedded in quartz; titanite.

Clifton Mine, Tyndrum.—Galena, in veins which traverse a great bed of quartz, with copper, green-red cobalt ochre, brown and yellow blende, heavy spar, and yellow copper pyrites.

Dunkeld.—Micaceous red iron ore, veins in primitive rocks, near.

Forneth Cottage.—Earthy chlorite in veins, along with common chlorite.

Glen Tilt.—In limestone, sahlite; tremolite; in foliated granular limestone, asbestuous tremolite; talc. Here also occurs a mineral resembling sanssurite, nearly pure white, or faintly tinged with green.

Glen Fargs.—Red stilbite; chabasie.

Glen Fernat.—Garnet.

Glen Turret.—Native gold.
Kinnoul Hill, near Perth.—In the amygdaloid and greenstone of, amethyst; agate, or Scotch pebble.
Blair Gowrie.—Pinite in porphyry.
Rumnoch.—Sahlite; and in the limestone, rutile.
Ochil Hills.—Compact felspar; clinkstone.
Tay River.—Quartz or agate pebbles.
Breadalbane, in.—Massive talc; potstone, or lapis ollaris.
Tullyallan.—Coal; sandstone.
Callander to Creif.—Puddingstone.
Cayuth near Dunkeld.—Blue slate

RENFREWSHIRE.

Bishoptown.—Fibrous prehnite, with needle zeolite, and analcine.
Erskine.—Analcine.
Gomock, near the village of.—Fluor spar, in secondary porphyry.
Hurlet, near Paisley.—Prismatic Epsom salt, as an efflorescence along with natural alum; alum as an efflorescence on the surface of bituminous shale and slate-clay; rock-butter.
Hartfield Moor, near Paisley.—Fibrous prehnite.
Paisley.—Laumonite.
Eglesham.—Lead ore; barytes.
Lochwinnoch Parish.—Coal; limestone; freestone.
Thornliebank, near Eastwood.—Schistus with petrifactions.

ROSS AND CROMARTYSHIRE.

Fortrose.—Common actynolite.
Strathpeffer.—Mineral spring of, a few miles west of Dingwall. An imperial gallon of the lower spring, according to Dr. Thomson's analysis, in 1828, yielding sulphureted hydrogen gas, 13·659 cubic inches; sulphate of soda, 52·710 grains; ditto lime, 30·686 grains; common salt, 19·233 grains; sulphate of magnesia, 4·855 grains; total, 107·484. N.B. The upper spring is the most powerful of the two.

ROXBURGHSHIRE.

Cheviot Hills.—Amongst the trap rock, pitchstone; and at the bottom of the morasses, bog iron ore.

STIRLINGSHIRE.

Alva, in secondary rocks at.—Cobalt bloom; nickel ochre; mispickel sulphureted silver ore.

Many years ago a vein of silver was wrought with considerable advantage in this parish. The metalliferous minerals were native silver, and silver glance, with ores of copper and cobalt; and the vein stones were calcareous spar, and heavy spar.

Airthrie, at, in the Ochil Hills, north-east of Stirling.—In veins, along with heavy spar and calcareous spar, grey copper.
Carbeth.—Very beautiful specimens of the red foliated and radiated zeolites.
Kilsyth.—Ironstone; limestone; red and yellow jasper; agate; and porphyry.

Garrel Glen, near Kilsyth.—Sandstone quarry.
Killearn.—Limestone; sandstone; jasper; basaltic columns.
Campsie Hills.—Compact gypsum.
Carron.—Common argillaceous ironstone.

SUTHERLAND.

Assynt.—In marble slate spar, black lucullite.
Assynt Caithness.—White limestone.
In gneiss, in this county, fluor spar occurs.

WIGTONSHIRE.

Whitehorn Parish.—Lead; copper; variegated marble.

ISLANDS OF SCOTLAND.

Arran.—Smoky quartz in cavities in the granite; felspar in many distinct forms in the porphyry of *Drumodune;* epidote; augite; mesotype; sulphate of barytes; prehnite; stilbite in cavities in the granite, in small quantities, and in minute crystals; coal; rock crystal in cavities in granite; adularia; pitchstone traverses granite in veins and in beds in the red sandstone; glassy felspar embedded in pitchstone porphyry; clinkstone; earthy common felspar; claystone with secondary porphyry; in secondary syenite and clay-slate, epidote occurs; anthracite, in quartz veins that traverse clay-slate, common chlorite.

Little Cumbray.—Indurated steatite in nodules, as large as a pea, of a green, pale greyish, and deep sap-green hue, sometimes containing calcareous spar in the centre. Green earth also occurs among these nodules, presenting considerable diversities of aspect.

Bute.—Chlorite colouring quartz; calcareous spar, of a pink colour, and nearly transparent, is sometimes found in argillaceous schists, but generally occupying the cavities completely, or so nearly filling them as to present no decided geometric forms. Prase, in quartz veins, which traverse clay-slate, common chlorite; brown spar, displaying the ordinary curved rhomboidal figure, and frequently covered with the golden metallic lustre, sometimes occurring in this mineral; another variety is also found, but much more rarely, of a dark red-brown colour, and very deceptive appearance, resembling on a superficial vein the dark red varieties of common felspar. In the clay-slate, micaceous iron ore, presenting specimens of great brilliancy, intermixed with quartz and calcareous spar. Oxidulous iron occurs in the form of octohedral crystals in the chlorite schist; at the northern extremity of the island, coal.

Lamlash, Isle of.—Pitchstone in small veins in the trap rocks of; clinkstone; earthy common felspar, claystone with secondary porphyry.

HEBRIDES.

Coll.—Large-sized crystals of hornblende, near *Ben Feoul;* bright green actynolite, of a lamillar structure; massive brown garnets; a vein of steel-grained galena, lying in a fissure of the gneiss, and terminating in the sea augite.

North Uist.—Bog iron ore, with pyrites.

Harris.—Sahlite; asbestus in the neighbourhood of *Nishishee.*

Scalpa.—Serpentine, with veins of dark green and pure white steatite, together with veins of splendent asbestus and small particles of chromate of iron dispersed in the serpentine.

Canna, Isle of.—Bituminous wood in separate pieces, in trap tuff; stilbite; analcime.

Glass, Isle of.—Serpentine.

Icolmkill, Isle of.—In a rock composed of red felspar and quartz, epidote; in dolomite, tremolite; in limestone, steatite.

Isla, Isle of.—A mass of capillary native silver was found in the veins traversing the blue-coloured limestone of this island; galena; cipolino limestone.

Lewis.—Sulphate of barytes is found in the conglomerate, near the *Chicken Head*, but not in great quantity, nor does it present any regular crystallizations; common actynolite.

Rona (East).—Tetrahedral grouped crystals of oxidulous iron are not unfrequent in the granite veins.

Rasay.—Prehnite, of a white colour.

Jura, Isle of.—In a micaceous rock, a rare variety of foliated chlorite occurs.

Mull and Skye.—The vesicular cavities of the trap rocks afford crystals of chabasite.

Rum, Isle of.—Substance resembling heliotrope found there; semiopal; hypersthene with apatite; embedded in the pitchstone, glassy felspar; augite; chrysolite.

Rona.—In slender veins, epidote traversing a rock composed of felspar and quartz, and felspar and hornblende; wolfram.

Shiant Islands.—Amongst the trap rocks, rock milk; pink opalescent quartz. In *Corrivelan*, occupying rifts in the silicious schist, wavellite.

Island of Skye.—In trap rocks, mountain soap; in greenstone, bronzite; mealy zeolite; in the secondary trap rocks, apophyllite; granular magnetic iron sand; in the secondary trap formation, bituminous wood; jet; stilbite in amygdaloid; chabasie; laumonite; analcime.

Scavig Loch, at, in this Island.—Hypersthene, forming a constituent part of a mountain rock.

Mac Callister's Cave.—Fibrous limestone.

Storr (Sky).—Chabasie with stilbite.

Steat.—Common actynolite.

Talisker.—Chabasie; many beautiful varieties of mesotype; analcine.

Larne.—Laumonite.

Loch Eynort and Loch Brittle, between.—Laumonite; ichthyophthalmite; olivin.

Portree and Strathaird.—Prehnite.

Dunvegan, near, and in the parish of Kilmuir, at.—Steatite in considerable quantity, of a dirty greenish colour.

Broadford, a mile and a half south from, and on the way to Kilbride.—Idocrase at the junction of a trap-dike, with the calcareous rock it traverses. The dike averages about four yards in width.

Oransa, near the small isle of.—Actynolite.

Quarry of Strath, at the.—Calcareous, steatitical, and white laminar substance, highly coloured with the red oxide of manganese, forming a mineral of considerable beauty; oxidulous iron in thin veins, traversing the hypersthene rock.

Ulva.—Analcime.

Fladda, Lunga.—Indifferent specimens of mesotype and analcime.

Jura.—Among the beds of chlorite schist, common scaly chlorite is sometimes found in nodules, a circumstance not uncommon in similar situations. Occasionally it is found crystallized, an occurrence much more rare, and not observed elsewhere, except in the vicinity of *Glen Tilt*. The crystals are of considerable size, and present the complicated forms so well known to mineralogists, as occurring in that chlorite which accompanies the garnets of Piedmont.

Isla.—Chlorite embedded in quarts; galena intermixed with copper pyrites in the limestone in the neighbourhood of *Portaskey*. In the white limestone of *Lossit Hill* there is a considerable bed of brown hæmatite, interspersed with minute crystals of oxidulous iron, of which some has been sold and exported.

Staffa.—Stilbite in amygdaloid; analcime.

Tiree.—Sahlite in granular limestone; coccolite in pink marble; sphene in pink marble.

Kerrera.—Red stilbite occupying the fissures of grauwacké schist in the vicinity of a trap vein; heliotrope, found on the shore in fragments and nodules, that appear from their forms to have been detached from the conglomerate rock.

Mull Canna.—Pitchstone occurs either embedded or in the form of veins in secondary trap and porphyry rocks. In the secondary trap rocks, foliated and mealy zeolite; natrolite.

A LIST OF MINERALS IN THE SHETLAND ISLANDS.

1 Andalusite.
2 Sahlite.
3 Precious garnet.
4 Schiller spar.
5 Chromate of iron. I. 1.
6 Common magnetic iron ore. I. 2.
7 Native copper. C. 1.
8 Micaceous iron ore. I. 3.
9 Asbestus.
10 Epidote.
11 Brown hæmatite. I. 4.
12 Copper pyrites. C. 2.
13 Grey copper. C. 3.
14 Malachites. C. 4.
15 Sparry iron. I. 5.
16 Iron pyrites. I. 6.
17 Compact brown iron ore. I. 7.
18 Scaly brown manganese ore.
19 Syenite (prismatic).
20 Grenatite.
21 Hydrate of magnesia.
22 Granular magnetic iron sand. I. 8.
23 Foliated copper glance. (Fair I.)
24 Precious serpentine.
25 Compact heavy spar. (Fair I.)
26 Galena.
27 Rose quartz, or quartz hyalin rose.
28 Porcelain clay.
29 Common garnet.
30 Rhætizite.
31 Steatite.
32 Common chlorite.
33 Actynolite.
34 Potstone, or serpentine ollaire.
35 Amianthus.
36 Talc.
37 French chalk.
38 Indurated talc.
39 Verde antique.
40 Native oxide of chrome.
41 Bog iron ore. I. ix.
42 Calcareous spar.
43 Fluor spar.

ORKNEY AND SHETLAND.

Fetlar.—In serpentine, schiller spar and chromate of iron.

Fair Isle, between Orkney and Shetland, twenty-five miles S.S.W. of Dunrossness.—Foliated copper glance.

In a rock of sandstone, upwards of 300 feet in height, to the northward of *Naversgill*, and directly exposed to the westward ocean, accompanied with copper-green malachite, and fragments of compact heavy spar; the vein of copper ore is only about six inches in breadth.

Mainland.—Micaceous iron ore; precious garnet; in the serpentine, asbestus; epidote in syenite; brown hæmatite; native copper in red sandstone, along with copper pyrites, grey copper, malachite, brown hæmatite, sparry iron, and iron pyrites; yellow copper ore in a vein in red sandstone, with grey copper, malachite, and native copper; iron pyrites, sparry iron, and brown iron ore; syenite.

Fitful Head.—Micaceous specular iron ore.

Sandlodge.—Compact brown iron ore, and scaly brown manganese ore.

Fetlar.—In the serpentine, asbestus.

Unst.—Ditto. ditto.

Papa Stour.—Compact felspar; in a trap rock, fluor spar.

Pomona.—Petroleum.

Sandlodge.—In mica-slate, prismatic syenite.

Hillswick.—Ditto. ditto.

Hoy, Island.—Brown hæmatite.

Holyhead, Island.—Precious serpentine.

Sandlodge.—Fibrous malachite occurs in veins that traverse red sandstone, in which it is associated with grey copper, copper pyrites, and brown iron ore.

Stromness.—In conglomerate rocks, galena.

Unst.—Andalusite in mica-slate; sahlite; precious garnet; schiller spar. In the serpentine, chromate of iron, and common magnetic iron ore.

Yell.—Native copper in small veins, and embedded portions in the serpentine.

Dunrossness.—In the epidotic syenite of this district, much ferruginous matter, under the form of an oxide, is diffused throughout; iron pyrites, and occasionally a rose-red colour, which is imparted to the syenite, gives some faint token of the presence of the carbonated oxide of manganese.

Garthness.—Iron pyrites occurring in a highly indurated blue quartz, with copper ore in a sparing quantity.

Fitfiel Head, at the Girths of Quendal.—In the clay-slate is a vein of iron mica twelve feet thick.

Cliff Hills.—Light blue, or greenish blue phyllade, or clay-slate, with scales of mica diffused in minute particles.

Sandlodge.—The principal vein of copper formerly worked here is fourteen feet broad. In the magnesian sandstone copper pyrites, with brown hæmatite, sparry ironstone, native copper, and grey copper ore; fibrous malachite; columnar bog iron ore; micaceous iron ore; brown iron ochre; dark brown stalactitic iron ore; and earthy matter, charged with iron, arising from the debris of other ores.

Many of the above substances may now be collected amidst the rubbish thrown from the mine, which has been long since abandoned.

Friable and amorphous carbonate of copper, colour rich green; beau-

tiful carbonate of copper of an emerald green, crystallized in capillary fibres of a silky lustre, diverging in radii from the centre; this species is found embedded in the iron ore; native copper.

Coningsburgh Cliffs, near.—A vein of copper pyrites was wrought here a few years ago, but without much success.

Kirkaness, on the shore of,—are beautiful specimens of rose quartz, called on the Continent quartz hyalin rose.

Fetlar, to the S.W. of, near the point of Lamhoga.—Felspar decomposed in every stage, and converted into a glistening yellowish white porcelain clay.

Woodwick, west of Unst, about a mile to the east of.—In the gneiss or mica-slate, crystals of grenatite, of a reddish brown colour, and resinous lustre.

Unst, N.W. of, between Burra Frith and the Loch of Cliff.—Garnets in mica-slate.

Hillswick Ness, on the west of, a little to the north of Vanleep.—Crystals of common garnet are thickly interspersed among the strata of mica-slate and quartz; in the white quartz are embedded aggregated crystals of syenite, of a reddish white colour, closely resembling the variety obtained from the Tyrol, and sometimes described under the name of rhætizite.

Queen Gio, east of Hillswick Ness.—Mica-slate, studded with large garnets.

Carnebie.—Steatite, like potstone, but softer, and of a brownish purple-red colour, and in conjunction with brilliant dark green earthy foliated common chlorite; and interspersed in this mass are numerous small octohedral crystals of magnetic iron ore, of a bluish black colour.

Vord Hill, Fetlar.—Through the serpentine, chromate of iron is disseminated, in grains not larger than gunpowder.

Nithister, at the banks of.—Black and greenish black coloured massive hornblende; actynolite of a fibrous structure, of a splendid leek-green or pistachio-green colour, and of a silky lustre, in masses of two feet in thickness.

Near this place is to be found an embedded rock of a leek-green colour, a variety of potstone or serpentine ollaire, also olive-green serpentine, unctuous and variegated with greenish black spots; associated with it is a variety of steatite, differing from the potstone, in being much softer, and in its colour, which is brownish red, and popularly known under the name of *kleber*, being medicinally used as an ointment, in excoriations and burns.

Uric, near, Unst, Isle of.—Crystals of diallage, attaining the dimensions of half an inch.

Uyra, Isle of.—Ditto.

Balta, Island on the east coast, in the Diallage or Euphotide of.—Amianthus composed of very long and most beautiful white silky fibres.

Triesta Bay.—Strata, on the shore from west to east, holding an intermediate rank between black chalk and glossy alum slate, of an iron-black colour and metallic lustre, and soiling the fingers like graphite.

Triesta Loch.—Magnetic iron ore, in the form of grains, intermingled with its sands.

Houbie, east of.—Dark green-coloured serpentine, containing much talc, as well as asbestus.

Golden Gio Creek, between the north point of Mouness, named the Ham, and the small open bay of Sandwick.—Iron pyrites, in minute granular particles, diffused in chlorite slate.

Odsta, north-west angle of Fetlar.—Between the gneiss and serpentine earthy chlorite is seen, in a thin bed, containing small octohedral crystals of magnetic iron, of a bluish black colour.

A variety of talc, in no respect differing from the common French of commerce.

Saxaford Hill.—Quantity of magnetic iron ore, diffused throughout this mountain mass, so as to affect the compass in a remarkable degree.

Norwick Bay.—Grass-green and pistachio-green coloured talc, interposed between the serpentine and the mica slate.

Scaw, Island, and Lambaness.—In the porphyritic gneiss, large crystals of felspar, of the dimensions of two inches occur.

Swinaness.—Indurated talc, of a greenish grey and apple-green colour; greenish and whitish coloured amianthus, traversing the rock in thin veins, and common asbestus of a greyish white and greenish colour.

Hagdale, north-west of, near the Head of Haroldswick.—Native copper has been detected in small quantities.

Belmont, near.—Carbonate of lime, with a soft variety of yellowish serpentine or verde antique occurs here.

Swinaness.—Hydrate of magnesia, traversing serpentine in all directions, in veins from half an inch to six or eight inches broad, much mixed with the magnesian carbonate of lime and talc, from which latter it may be easily distinguished, as it marks white paper with a silvery powder, whereas talc gives only a polished line, and leaves none of its own substance; it moreover scratches talc.

Unst.—Chromate of iron abundant in the serpentine of, particularly in the vicinity of *Balta Sound* and *Haroldswick*, and between *Balta Sound* and the *Lock of Cliff*.

Hagdale, west of, as far as the Hill of Crucifield.—Large fragments of chromate of iron occur.

Buness, House of.—Considerable mass of chromate of iron with indurated talc.

Unst.—Native oxide of chrome, sparingly diffused through small fissures or cavities of the chromate of iron in this island.

Swinaness, north entrance of Balta Sound.—Noble serpentine, in a bed of three or four feet in thickness, translucent, and of a blackish green and olive-green colour.

Colafirth Voe, on the south of.—Hornblende of a shining black colour; serpentines, syenite and actynolite, with potstone and amianthus.

Kleber Gio, Peninsula of Fiedeland.—Indurated talc; steatite; asbestus; and amianthus with chlorite; in which are disseminated crystals of magnetic iron ore and iron pyrites.

Aithness, on the brow of the Hill of.—Bog iron ore occurs abundantly.

Kirksands, Point of Braguster, Papa Stour.—Dark liver-coloured amygdaloidal claystone, containing in its cavities calcareous spar, heavy spar, fluor spar, quartz, crystals, calcedony, and green earth.

Papa Stour.—In several parts of, very far inland, blackish green-coloured fragments of glassy actynolite with hornblende abundantly strewed over the ground.

MINERALOGY.

BY GEORGE ABBOTT, ESQ.

VERY much could be said as to the national and private utility of a general diffusion of some slight mineralogical knowledge, did the nature of this volume permit of lengthy detail; but we may be allowed to call attention to the fact, that nothing in the intrinsic or natural value and capabilities of a country is of such permanent benefit, as its mineral fecundity, nor so largely and quickly conducive to its increase of population, wealth, and civilization; or so fostering and impulsive in its influences upon the progress of its commerce, manufactures, and arts. Every ton of mineral raised is so much gained, and absolutely added to the previous wealth of the community. Occupation has been given, in the raising and preparation of the ore, and in the smelting and conversion of the raw mineral into a refined metal,—giving rise to various changes and adaptations of the chemist, the engineer, and the artisan,—for accelerating the advancement of manufactures and occupations, and ministering to the requisites, comforts, and luxuries of social refinement. Thus important are its public or national effects; the private or individual advantages and utility of estate proprietors, and their land-agents or stewards, possessing some slight knowledge of this science, is so obviously important to them, that it appears perfectly marvellous there should be so very few able to tell the nature of the mineral found on their estates, or to judge as to the probability of its being abundant, or obtainable in any workable quantity.

There being no separate epitome of the metalliferous minerals so arranged as to afford the novice immediate reference to easy means of discriminating the visual and chemical distinctive characters of the more frequent and abundant metalliferous ores, the following details of their habitudes and natural character have been drawn up with the object of assisting the estate owners, the lessees, and the miners, to distinguish the species and qualities of the minerals found on their properties.

They are not presented as a complete description or scientific arrangement of *all* the metalliferous ores, or of the *whole* contents of each species, but as one preventing confusion and difficulty, and saving the trouble of wading through volumes; and therefore we only describe such as are either most valuable, or most useful, and most frequent, or most abundantly deposited. These will be found to comprise but a comparatively few species

of the ores of each metal, as the others, though much more numerous, are either rare and in such small quantities as to be unworkable, or accompany the more abundant ores hereunder distinctly described, together with easy chemical means for deciding the pervading metal of the particular species of mineral.

ANTIMONY.

Native Antimony.—Colour—tin-white, by exposure to atmosphere tarnished yellow. Occurs—reniform, amorphous. Structure—lamellar, plated, somewhat sectile, and easily frangible. Blow-pipe, melts easily. Found in primitive rocks, often with the sulphuret.

Contains—from 1 to 3 per cent. of *silver*, and about 98 of antimony.

Grey Sulphuret.—Light or dark lead-grey. Compact, fine-grained, plumose. Lustre—metallic, sometimes externally dull or dark, irridescent. Occurs—massive, disseminated, and crystallized, in rhombic prisms variously modified. Easily melts with blow-pipe, and even in flame of a candle, and evaporable with *white* vapour, and *sulphury odour*.

Found in veins and beds in gneiss, schist, granular limestone, and various transition rocks in Europe, Asia, and America. In the Pillaton Mines, Wheal Leigh, Wheal Copley, Wheal Grenville, to the south and south-east of Cornwall, and in St. Stephen's, Constantine, and other parishes in Cornwall; also in Cumberland, Westmoreland, and various parts of Scotland.

Contains—64 to 75 per cent. of antimony.

Yellow Oxide.—Various shades of yellow, passing into brown. Dull, soft, heavy, brittle, and with earthy fracture. Usually met with at the top of the veins or lodes, or surrounding and investing the compact sulphurets.

Distinctive character.—Nitric acid oxidizes, but *does not dissolve* antimony. Aqua regia gives a brown solution; but, to the antimony reduced to oxide, add sulphureted hydrogen, which produces precipitate *orange red*.

By a plate of zinc, antimony in the metallic state is thrown down in the form of a black powder.

Blow-pipe.—Salts containing oxide of antimony are easily reduced, if mixed with carbonate of soda, and heated on charcoal by the interior flame of the blow-pipe.

ARSENIC.

Often found in the native state. Its ores are few, but it generally pervades the mineral veins, and either accompanies the matrices and gangue, or forms a component part of the other metals and ores. The name, arsenic, alludes to the great power of the metal.

Native Arsenic.—Colour—of a greyish black externally, internally whitish lead-grey. Occurs—massive, and in a great variety of forms.

Found in primitive rocks (generally), and accompanying the ores of silver, cobalt, nickel, and copper.

White Oxide.—Colour—snow-white or tinged yellowish, reddish or greenish. Occurs—earthy, capillary, investing, and crystallized.

This oxide is so very like pharmacalite, that it is often taken for it; but *this* oxide is soluble in water, the pharmacalite is not.

Red Sulphuret (Realgar).—Colour—brilliant red, sometimes a tinge of bronze, translucent, rarely transparent. Occurs—massive, disseminated, investing, and crystallized, with conchoidal fracture, soft and yielding to the nail.

Found in veins, in primitive rocks, and among volcanic matters. Contains—arsenic 69, sulphur 31.

Yellow Sulphuret (Orpiment).—Colour—bright brown, yellow. Occurs—disseminated, investing, in stalactites, and in minute crystals, and is found in both secondary and primitive rocks, in the vein-stones of various countries, and associated with ores of copper, red silver, &c. &c.

Contains—arsenic 62, sulphur 38.

Arsenical Pyrites (Mispickel).—Colour—tin-white inclining to yellow. Occurs—massive, acicular, and variously crystallized. It gives fire with the steel, and the sparks give out a little white smoke with *the smell of garlic*.

Found in beds and veins, associated with the tin and copper ores. Contains—arsenic 40, iron 50.

This is one of the Cornish *mundics*, and is wholly wasted, although sometimes rich for silver.

Distinctive character.—Native arsenic, with the blow-pipe, fuses readily, and burns with a *bluish* flame and dense white vapour, and volulizes, with the exception of a portion of iron, which is often mixed with gold and silver.

The sulphuret of arsenic, with the blow-pipe on charcoal alone, burns with a pale *yellow* flame.

Arsenical Iron (Mispickel).—Blow-pipe gives out arsenical vapour, *without destroying the form of the crystal*, which afterwards becomes magnetic.

BISMUTH.

This metal is often found in the native state, not in large deposits, but more frequently than is generally known.

Native Bismuth.—Colour—silver-white, and tinged with red, tarnished exterior, often crystallized and massive.

Found in primitive rocks, the gangue-quartz, jasper (often), sometimes with indurated clay, generally acompanies other ores of copper, tin, nickel, silver, arsenic, iron, lead.

Sulphuret.—Colour—light grey, inclining to steel-grey, crystallized in striated prisms and massive.

Contains—80 per cent. of bismuth.

Cupriferous Sulphuret.—Colour—light lead-grey, light steel or tin white with yellowish or reddish tarnish. Occurs—massive, disseminated, and acicular. Fracture—small-grained, uneven.

Plumbo Cupriferous.—Colour—steel-grey, often tarnished. Occurs—disseminated, and in striated crystals. Has been found accompanying copper, tellurium, and gold.

Oxide (*ochre*) *of Bismuth*.—Greenish yellow, or yellowish grey. Occurs massive and disseminated, structure fine-grained, sometimes earthy and dull, opaque, soft and friable.

Blow-pipe, on charcoal, easily reduced to metallic state. Lime precipitates oxide of bismuth from a cold solution of nitrates, *but does not lead*; and, therefore, *this is a good mode of separating bismuth from lead*.

The sulphureted ores, being pounded and digested in a flask in nitric acid, carbonate of ammonia throws down the oxide of bismuth. When washed, dried, and ignited, every 10 grains, are equivalent to 9 grains of metallic bismuth.

CHROME.

As the chrome colours have now become valuable, the following minerals are mentioned.

Oxide of Chrome.—Occurs—of a bright grass-green, and of a pale yellow, pulverulent and dull. Sometimes the green is found compact, with a somewhat crystalline structure. With heat *the green* changes *to yellow.*

Chromate of Lead.—Deep orange-yellow. Occurs—crystallized and massive, sometimes translucent, rarely transparent. Cross fracture—uneven, conchoidal.

Blow-pipe, gives out no garlic fume, and with borax metallic lead is reduced. This, and absence of garlic fume, distinguishes it from *orpiment* (the sulphuret of arsenic), which it much resembles.

Chromate of Iron.—Black, massive, disseminated, and crystallized, found in various countries, often in veins traversing serpentine.

Distinctive character.—The oxide of chrome is soluble by boiling in alkali, it gives then a green colour, and, *by further boiling the solution*, the oxide is precipitated.

This fact distinguishes it.

The presence of chromium or its acid, will be detected by carbonate of soda, or ammonia, with which it will become yellow. When fused with muriatic acid, a chromate assumes a dark green when heated.

Nitrate of lead, precipitates orange-red chromate of lead.

COBALT.

The Germans gave the name, meaning injurious, from the great quantity of accompanying arsenic.

The oxide of cobalt is very valuable, may be obtained from various ores, and is more frequently deposited than is generally supposed, with the arsenical ores of—copper, nickel, silver, tin, &c.

Sulphuret.—Colour—yellowish tin-white, or light grey. Occurs—massive, with an uneven fracture, also crystallized and reniform. Contains 43 of cobalt, and sometimes 14 of copper, 38 sulphur, and variable quantities of iron.

White, Arsenical.—Colour—yellowish white, sometimes tinged red. Occurs—in all the many-shaped crystals of the common pyrites. The crystals are often striated, also occurs, arborescent, stalactitic, and amorphous, yields with difficulty to the knife, is not very frangible.

Found in the veins of primitive mountains, also embedded in rocks, as in mica, slate, gneiss, &c.

Grey, Arsenical.—Colour—externally greyish-black, but when fresh-broken, of a steel-grey colour. Occurs—amorphous, and in curved lamellar concretions and stalactitic. Fracture—even, flat, conchoidal or fine granular, hard and brittle.

The white and grey arsenical cobalt accompany other ores in the

veins of primitive mountains, various countries. The arseniates of cobalt contain from 20 to 30 per cent. of cobalt, and 60 to 75 of arsenic.

Tin-white Cobalt.—Metallic, sometimes tarnished externally. Occurs—in various crystals, *often split* in different directions, with some of the planes *convex*, it also occurs reticulated, arborescent, stalactitic, and amorphous.

Found in the veins of other minerals of copper, tin, silver, &c. The cubes are generally streaked in three directions, and contain from 32 to 43 per cent. of cobalt.

Cobalt Ochre.—Bluish, brown, black, and yellow, dull and earthy, acquires polish by friction. Occurs—massive, botryoidal, mamillary, pulverulent, and investing.

Found generally in secondary rocks, with ores of copper, iron, silver, &c., in most mining districts.

Diarseniate of Cobalt.—Colour—various shades of red and crimson, and also whitish or greyish white. Occurs—in small masses, and botryoidal, investing, and in short acicular crystals, with glimmering lustre, or dull, and soft.

Found in primitive and secondary rock, with ores of copper, iron, lead, nickel, silver, in most countries. Contains—39 oxide of cobalt.

Distinctive character.—Blow-pipe. *All the ores* containing cobalt are easily distinguished by their giving bright blue to the glass of borax.

GOLD.

Native Gold.—Colour—bright yellow, brass, orange, or grey-yellow, and greenish yellow, and blackish; variously crystallized, and in threads, plates, grains, and veins.

Found in primitive formations, but not so much in those deemed the oldest of them. It is associated with the ores of silver, lead, copper, nickel, &c. &c., generally in quartoze veins, in granite, gneiss, and mica-slate, and hornblende rocks.

Gold is much more frequently deposited than is generally supposed, and would be often met with in examining the sides of the veins of various kinds of iron ores, and also in the backs and sides of the veins of tin, copper, antimony, lead, &c. &c., which carry a crumbly rusty quartz; also, in many of the *gossans* at the back and sides of the copper, and lead veins, near the surface.

The bottoms of alluvial deposits, and the sands of rivers in the neighbourhood of decomposed crystalline rocks, often produce large quantities. Gold is deposited in veins or lodes, *as well as* dispersed in the crystalline rocks, and is also mechanically combined with some metalliferous minerals and ores, particularly with the *sulphurets* of lead and copper, also with tellurium, mercury, and with oxide of tin; in colour from palish yellow, to silver-white.

Neither nitric nor muriatic acid has effect on gold. Found in heavy spar, and in ironstone. Occurs—foliated with mica, and sandy ironstone, chrome, iron, &c.

I. Take of the mineral, that portion which is supposed to be the richest in gold, having with it the least of stony matter, reduce to fine or impalpable powder, mix with four times its weight of subcarbon-

ate of potash, and one of glass of borax, melt the mixture in an earthen crucible, and after having fused it for half an hour, pour it out on a stone slab, suffer it to cool, again reduce it to a powder.

II. Place it in a flask, cover it with nitro-muriatic acid, digest in gentle heat for a few hours; decant the fluid, and repeat the digestions until the residue is of a pure white colour; let residue be washed, and add washings to muriatic solutions.

III. Place these solutions in a glass basin, and evaporate slowly over a lamp to dryness.

IV. Pour upon this dried residue so much boiling distilled water as will dissolve it, and filter the solution through paper placed in a funnel.

V. Then precipitate the solution with green sulphate of iron, till no further change of colour ensues, and let the whole stand undisturbed for some days; the gold will now be precipitated to the bottom of the vessel in the state of a brown powder.

VI. Decant the fluid from this powder, carefully collect the powder (which is the metallic gold) by putting it on a filter, and when perfectly dry, fuse it into a mass with a small portion of nitre;—if a white powder is seen on the nitro-muriatic solution, collect it by filtration. It contains 75 of silver.

A plate of zinc throws down gold from the chloride solution, in a metallic state.

Ammonia throws down a dirty yellow precipitate, *in the state of fulminating gold*, which is re-dissolved by an excess of ammonia.

LEAD.

Is stated to have been found in the native state. (?)

Sulphuret Galena.—Is lead-grey colour, blackish grey, and sometimes irridescent superficially. Generally amorphous, sometimes crystallized in the form of cube and octohedron. In beds and veins, in primitive and secondary mountains, in granite, in gneiss, in primitive limestone; clay-slate, secondary limestone, sometimes in the sandstones of the coal formation. It has a brilliant metallic lustre. Occurs—compact, steel-grained, specular. The light-coloured or steel-grained generally the richest for silver.

Contains—from 70 to 85 per cent. lead, and the fine-grained from 60 to 280 ounces of silver per ton of ore.

Carbonate.—Occurs—in beds and veins, *usually* accompanying galena. Colour—white, yellowish grey, smoke-grey, and greyish black, earthy, or sometimes tinged blue or green by copper. Found massive, granular, powder. Also in various crystals. Fracture—generally small conchoidal, sometimes small-grained.

Contains—about 80 per cent. oxide of lead.

Minium (Oxide of Lead).—Colour—Scarlet-red. Amorphous and pulverulent.

Sulphate of Lead.—Colour—yellowish, greyish, or greyish white, dirty smoke-grey; sometimes slight tinge of green or blue. Massive, and often crystallized, rhombic prisms or octohedron. Lustre—adamantine, vitreous or resinous.

Chromate of lead.—Various shades of red, and deep orange. Massive and crystallized.

Blue Lead.—Colour—between dull lead-grey and indigo-blue. Massive, and also crystallized in six-sided prisms, also fasciculated.

Jamesonite and Plumose Lead Ore and Antimony.—Antimony, dull lead-grey metallic striated needles.

Phosphate, Arseniate, Molybdate.—More or less yellow, green, brown, and brown-yellow, and green and wax-yellow. Crystallized in six-sided prisms, also in acicular crystals, and mamillated, botryoidal, and massive. Generally found mixed with, or investing here and there with the vein stuff of the sulphuret and carbonate, seldom found in quantity as workable ores.

I. Powder the lead ore, deposit in a flask with 6 of dilute nitric acid, repeat process several times.

II. Add to the nitric solution, previously evaporated to a small compass, muriatic acid, till no further cloudiness appears; let stand to completely precipitate, then decant the clear fluid; wash repeatedly, precipitate with alcohol.

III. The obtained precipitate consists of muriates of lead and silver.

IV. To separate the two, digest the precipitate in liquid ammonia; the *muriate of silver* will be *dissolved*, and the muriate of *lead* left behind. The solution of muriate of lead is effected by digesting in dilute nitric acid, by which the muriate of lead is dissolved, but not the muriate of silver.

V. Mingle the ammoniacal solution of silver with nitric acid; heat it for a few minutes, and precipitate the silver on a cylinder of copper.

100 parts of the muriate of lead, dried at a red heat, contain 75·2 metallic lead.

Sulphate.—May be decomposed by fusion with carbonate of soda. The oxide of lead remaining after washing off the alkali, may be dissolved in nitric acid. The oxide of lead may be thrown down by sulphate of soda.

Nitric acid dissolves lead. Solution colourless. Sulphuric acid throws down a white precipitate, *insoluble* in acid, but soluble in caustic potash or soda.

This last property distinguishes sulphate of lead from the sulphates of barytes, strontian, or lime.

Chromate of potash throws from the nitric solution a fine yellow precipitate.

SALT.

The common salt is the muriate of soda. It is found in beds, rocks, and springs. Its lustre is nearly vitreous, or dull ice. It is opaque, translucent, or transparent. Is of all colours, but purest when dead-white, or transparent in larger crystals.

It forms near a thirtieth of the sea-waters, and on land is very abundantly and commonly deposited. It is usually met in thick beds, either superficial or at great depths, sometimes great altitudes. It forms beds, isolated rocks, or whole mountains. Gypsum (sulphate of lime) almost always accompanies rock-salt. Reddish grey clay frequently alternates in

beds with rock-salt, which often rests on gypsum, and is covered by carbonate of lime.

NITRE.

Saltpetre, or nitrate of potash, occurs naturally on many of the open plains in warm countries. In Europe it is found in France, Spain, Italy, and occurs plentifully in Persia, Arabia, Egypt, Hindostan. In North America, in Kentucky; South America, near Lima, Cape of Good Hope, &c.

The various fresh uses, the rapidly and greatly increasing consumption, and the high price of this article, should induce its collection from various sources where it may be obtained, as the market value will now render it largely profitable to collectors in many countries and circumstances, where, hitherto, it has been neglected as unremunerative.

It is found in crusts, and capillary crystals, of a whitish or yellowish white; translucent, brittle; and occurs near the surface of the earth. Stated to be found on many of the plains in Spain; on chalk, in France.

URANIUM.

Some valuable pigments may be obtained.

Pitch Blende.—Greenish black-brown, greyish and brownish black, and black. Globular, reniform, massive, disseminated, and pulverulent. Fracture—uneven, or small conchoidal. Sometimes dull, but more often possesses a shining resinous lustre. Opaque, occasionally translucent. On the edges very brittle, sometimes scratches glass. Found in primitive rocks, sometimes in the veins of peroxide of iron (Withiel parish), in Cornwall, with sulphated protoxide and peroxide of uranium, of a brown colour, with uranite disseminated.

When pounded, it partially dissolves in nitric acid, only *very slowly*.

Uranite (Phosphate of Uranium).—Occurs—of a lemon-yellow, or more or less deep yellow, yellowish brown, apple, and emerald green, brownish and dull. Crystallized in prisms and octohedrons. Structure—lamellar, varies from transparent to opaque.

Found in copper, iron, and tin veins, in granite and clay-slate, &c.

Uranium, in the metallic state, has only been obtained as a brown powder, destitute of metallic lustre. There are two oxides, the protoxide and peroxide.

The sulphated *protoxide* of uranium exhibits the following character, with

Prussiate of potash, a reddish *brown* precipate.

The alkalies, carbonate of potash, and oxalic acid, throw down a *dirty green precipitate.*

When the *peroxide* is exposed to a red heat, it is converted into protoxide, and assumes a dark green colour.

The solution of peroxide in nitric acid has a greenish yellow colour. Prussiate of potash throws down *the reddish brown* precipitate, *so very characteristic of uranium.*

GRAPHITE, PLUMBAGO, BLACK-LEAD.

Colour—iron or steel grey. Occurs—in mass, lumps, and interspersed in rocks. Often lamellar, glistening metallic lustre, soft, and unctuous

to the touch, and not so brittle or scaly as the unctuous micaceous iron. The streak is lead-colour. Contains 90 carbon, 10 iron. Is mostly found in primitive rocks, granite, mica, slate, syenite, serpentine schist, granular limestone, &c.

NATIVE SULPHUR.

Has various tints of yellow, from yellow-brown and greenish yellow to deep orange. Found massive, disseminated, investing, and crystallized in acute octohedrons. Earthy and shelly lustre, and fracture conchoidal. Found in beds and veins in primitive and secondary rocks.

Volcanic Sulphur is very like the above, and is found in the fissures of lava near the volcanoes, or their craters, in all countries. That deposit now working near Naples has supplied Europe from the time of Pliny.

COAL.

Anthracite.—Colour of the massive is usually of an iron-black, often superficially tarnished of various colours. Occurs—massive, slaty, and columnar, it is sometimes met with a splendid metallic lustre. Fracture—conchoidal, shining, light and brittle. It burns without flame, and gives no sulphureous or bituminous odour, and leaves a white ash.

Slaty Anthracite.—Colour—black or blackish brown. Structure—imperfectly slaty with a somewhat metallic lustre. Cross fracture flat conchoidal, slightly sectile, frangible, brittle. Occurs—in primitive and secondary rocks, in *veins* of mica-slate; with *native silver* in clay-slate in gneiss, in grauwacké. Scotland in the trap-rocks. England in the coal formation of Brecon, Carmarthen, and Pembroke, in Wales, and in Kilkenny in Ireland. It is called blind coal, stone coal, Welsh culm, and Kilkenny coal.

Common Coal.—Colour—black, often tarnished. Structure nearly slaty. Cross fracture small and imperfectly conchoidal. Occurs—massive, and burns with much smoke and sulphureous vapour. It contains variable proportions of earthy ingredients, found in most European countries, and is the common produce of the most extensive collieries. The Newcastle coal contains 75·28 carbon, 4·18 hydrogen. The Glasgow *splint* coal, 75 carbon, hydrogen, 6·25. The Glasgow chert-coal, same kind as the Staffordshire, 74·45 carbon, hydrogen 12·4.

Cannel Coal, "Kennel Coal," "Parot Coal," "Candle Coal."—Colour—greyish black or black. Occurs—massive, the fracture large, flat, conchoidal, with a faint glimmer or resinous lustre, brittle; it cracks with a slight heat, and *bursts into flame, and falls into pieces.* It occurs in most of the common coal-fields, frequently in the upper coal-beds of Wigan, Lancashire, Clee Hill, Shropshire, also in several places in Scotland.

It is sometimes used instead of candle. Its fine compact texture causes it to be turned into small trays, inkstands, toys, &c.

Lignite, or "Wood Coal," "Brown Coal."—Colour—brown or brownish black. Fracture sometimes earthy, it is then called "Moor coal." When fibrous, with a compact structure and fracture, it is called "Wood coal;" it is quite distinct from native carbon or charcoal. It is found in various countries in beds of considerable thickness, and of many miles in extent; also in the great underground forest and amber mines of

Prussia. It occurs in Iceland, France, Bavaria, and Ireland and England. In six beds of various thickness at Bovey Tracey in Devonshire, some of it is black, with a glossy conchoidal fracture, and known by the name of "Bovey coal."

IRON.

Is sometimes found native. Colour—light steel-grey, with a metallic lustre. Stated to have been found massive, cellular, ramose. It is malleable and flexible, and has been found in several countries, but is rare, and in small quantities.

Oxidulated Iron.—Colour—iron-black, with a shining or metallic lustre, or glimmer. By Berzelius it is stated to contain 28·14 protoxide, 71·86 peroxide, of iron. *The massive is the native loadstone.* Occurs—compact crystallized and earthy. Found generally in primitive mountains, and very often accompanied by other minerals, silver, tin, lead, gold, iron pyrites. It occurs in Gwendron, St. Just, St. Stephen's, and other parishes in Cornwall, and in Devon, Scotland, and Ireland. Earthy oxidulated iron, chromiferous and titaniferous in Cornwall, at Hunstanton in Norfolk.

Specular Iron.—Colour—a deep steel-grey. Occurs—in prismatic and transition rocks, lamelliform and crystallized, in many forms, and in mass, in beds, and veins, has metallic lustre internally, and often a splendent or brilliant external irridescent tarnish. It contains 69 of iron. It is sometimes accompanied by oxidulated iron.

Found in various parishes in Cornwall and in Devon, Cumberland, Lancashire, and Scotland. It is sometimes found micaceous, in thin minute scales, in Devonshire, Cornwall, &c., and also in small flat crystals in the fissures of volcanic lava.

Arsenical Iron (Mispickel).—Is nearly of a tin-white colour, or with a tinge of yellow, massive, acicular, crystallized, contains 58·9 iron, 42·1 arsenic. Occurs—in veins and beds in primitive mountains, associated with the ores of copper, tin, lead, &c. &c.

The argentiferous ("*mundic*," of Cornwall), contains *silver*, from 1 to 15 per cent., or from 240 to 3,600 *ounces of silver per ton*, yet no use is made either of the 58 per cent. of iron, or the silver; all is thrown aside as "*mundic*;" though it sometimes contains gold as well as silver, it is never properly examined.

Sulphuret of Iron.—Iron pyrites. Colour—generally brass-yellow, various, yellowish, brownish, or steel-grey. Occurs—in the rocks, beds, and veins of other minerals, either amorphous, mamillated, pseudomorphous, and variously crystallized. The cross fracture is granular or uneven. *It does not yield to the knife;* this distinguishes it from *copper* pyrites; it gives *sparks* with the steel; *copper* pyrites does not.

Contains—47·85 iron, sulphur 42·15. This is also thrown away as "mundic."

Radiated Iron Pyrites.—In masses in various forms, fibrous, radiating. *Hepatic pyrites.* Occurs—in all forms, generally of a clove-brown externally, and internally more of a steel-grey. *Auriferous* pyrites, generally of a deep yellow colour, in grains, and crystallized in the form of a cube, deeply striated, sometimes partly decomposed externally. Found in great quantities in the gold-mine of Beresoff in Siberia.

Magnetic Iron Pyrites.—Colour—yellowish white, reddish or brownish,

loses its lustre by exposure. Occur—massive. It contains more iron than the common pyrites; affording 63 iron, and 36 sulphur. Found in the veins of the ores of copper, tin, &c. This is "mundic."

Pseudomorphous Iron Pyrites.—Found in the crevices of wood. The interior of fossils, ammonites, &c., and plentiful in the marl and other strata about chalk. Sussex, Kent, &c.

Red Iron Ores (Peroxide of Iron).—Hæmatitic and compact, fine-grained, fibrous, botryoidal; external colour from bluish to iron-grey, with more or less metallic lustre, sometimes red and without lustre, internally red or brownish red. The structure is often fibrous and radiating without lustre, broken in other directions. Structure—concentric, lamellar. Occur—in beds and veins in primitive and secondary mountains; plentifully in Cornwall, Devon, Cumberland, Lancashire, &c., and in Scotland and Ireland.

Compact red iron ore, scaly red iron ore, red ochre, and red chalk. The fibrous and red hæmatitic contains as much as 90 per cent. oxide of iron. The compact is often of a reddish or iron-grey colour externally; yields easily to the knife; powder red.

Brown Iron Ores (Peroxide).—Are numerous. Occur—compact, fibrous, massive, botryoidal, stalactitic, scaly, ochry. The *fibrous* variety is usually of a clove or blackish brown, and often externally of a steel-grey, and splendent, concentric, lamellar, in one fracture, and in the other disposed in concentric bands of brown of lighter and deeper shades. Contain 80 per cent. peroxide of iron. The compact brown iron ore is stated to contain 84 per cent. peroxide of iron. Scaly brown iron ore consists of small particles, either loose or slightly cohering.

These brown ores occur in primitive and secondary rocks in very similar circumstances as the preceding red ores, but in jaspery portions of the veins; these brown ores often contain *native bismuth*, and *native silver*. Dentritic, and in cubes.

The red ores of iron make very good cast and malleable iron. The brown ores afford a much harder iron, and very good steel.

Black Iron Ores.—Found hæmatitic, stalactitic, massive, with splendent, glimmering, or dull fracture, and with concentric, lamellar, or fine-grained structure; also dull, compact, and slightly cohering, or pulverulent, bluish black, and splendent, sometimes of a compact earthy or shelly fracture, somewhat unctuous, also harsh, friable, and soiling. The contents of these ores vary very much; they all contain more or less manganese.

Umber.—Is of a clove-brown, blackish or yellowish brown, sometimes massive, with an earthy or slightly shelly fracture, and of a slightly glimmering lustre. Soft and staining. Oxide of iron 48, manganese 20, with silex, alumine, and water.

Bog Iron Ore.—Compact, indurated, friable. The compact occurs—amorphous, tuberous, and granulated. Colour—brown, or brownish black. Fracture—small, conchoidal, with a glistening or resinous lustre. Consists of 66 of oxide of iron. The indurated occurs, amorphous, and vesicular, of a dark yellowish brown, or grey, with earthy fracture, dull, and soft. The friable bog ore occurs in grains and masses, sometimes tuberous, fracture earthy.

Spathose Iron Ores—(Carbonate of Iron). Colour—of a reddish brown, brownish yellow, yellow and brownish black, variously crystallized, also

massive. It yields easily to the knife, affects the magnetic needle. Carbonate of iron blackens before the blow-pipe, at a slightish heat, and leaves protoxide of iron, very attractable by the magnet. *This distinguishes it from pearl spar*, for which it is sometimes taken.

The massive carbonate of iron is generally crystalline, with a lamellar structure. Is stated to give 60 to 66 of iron.

This is an excellent ore for the cheap production of steel of a very fine quality. Occurs—in beds and veins of primitive rocks.

Argillaceous, or Clay Ironstone.—Colour—ash-grey, inclining to bluish, yellowish, brownish, or reddish brown. Amorphous, and in flat tabular masses, also in globular, reniform, or irregular pieces. Fracture—even, earthy, with sometimes a slaty structure. Occurs—in most of the *slate-clay* coal deposits, and in beds, and veins of *clay-slate* of the transition rocks.

Phosphate of Iron.—Colour—various shades of blue, greenish, and yellowish blue. Crystallized and earthy. The crystals are generally small, long, flexible prisms. The earthy phosphate, on first exposure to the atmosphere, is yellowish grey or greenish white, and afterwards turns blue or bluish. Found massive, disseminated, and coating, sometimes loose or slightly cohering. Earthy fracture, dull, meagre. Is light and slightly soils. Some of it contains 47 oxide of iron, and phosphoric acid 32. It occurs in clay, and in mud, mingled with animal matters, which produces the phosphoric acid. It is also found in or near the surface of peat bogs.

Distinctive Characters.—Peroxide of iron, 3·5 iron, 1 oxygen. *Black*, or nearly black blue, renders a *dark bluish green* solution with acids. Oxalic acid strikes a yellow colour in the liquid, and after some time a yellow *precipitate falls down*, the oxalate of iron.

Peroxide of Iron.—3·5 iron, 1·5 oxigen. *Red* or brownish red. The acid solution gives a *red or somewhat yellowish brown colour*, and oxalic acid gives *no precipitate*.

Magnetic Iron Ores—must be fused with three times their weight of carbonate of soda, to render them soluble in muriatic acid; to the muriatic solution add a little nitric acid, and digest for some time, in order to peroxidate the iron, concentrate the solution, but not until quite dry; then dilute with water, neutralize with ammonia, and precipitate the peroxide of iron.

Specular Iron Ores.—Fuse, with anhydrous carbonate of lime, and then wash, &c., as before.

COPPER.

Native.—Massive, reticulated, investing, and in plates. Found native in primitive rocks, sometimes accompanied with gold.

Sulphuret.—Colour—lead or iron grey, and approaching to black superficially; internally varies from lead-grey to tin-white. Crystallized, also massive. Varies in hardness. Fracture—flat conchoidal. Various proportions of copper; from 64 to 81 per cent. of copper.

Arsenical Copper Pyrites.—Between *silver-white* and pale *brass-yellow*. Glistening metallic lustre, but soon tarnishes. Massive and disseminated, fine-grained, uneven, yields easily to the knife. Contains 40 per cent. copper. One of the Cornish "mundics."

Copper Pyrites.—Colour—various shades of yellow. Massive, stalac-

titic, crystallized; often the crystals are externally irridescent. General form—tetrahedron, also botryoidal and mamillated. Structure of fracture varies in grain and hardness. Always *distinguishable from iron pyrites* by yielding to the knife, which the iron does not. Contains about 30 copper, and 35 sulphur. The quantity of copper is variable.

Red Oxide of Copper.—Red, of various shades. Massive, disseminated, crystallized, octahedron, and its varieties; capillary crystals very minute, transparent, very slender. Massive, intermixed with red copper, and often with green carbonate. Varies in the quantity of copper from 57 to 88 per cent. of copper. Tile-ore, of a brick-red or reddish brown, and internally blackish, or a metallic grey. Fracture—hard, compact, and earthy. Yields easily to the knife. Variable quantity of copper. Generally a very rich ore.

Black Oxide of Copper.—Generally investing other ores. Pulverulent, and soils the fingers. Burns with *green flame*. Often found investing native and red oxide of copper, and also the sulphurets, and blue and green carbonates.

Grey Copper.—Colour—grey, slate-grey, near to iron-black. Occurs —massive, investing, and crystallized.

Some of this ore contains large quantities of silver, from less than 1 to upwards of 30 per cent.; some very little silver. Then, the copper varies from 24 to 40 per cent.; but when the silver is large, the copper is only from 13 to 30 per cent. Found in various countries, in veins, and accompanying other ores of copper, lead, &c.

Seleniet of Copper.—Colour—grey. Silver 38·93, copper 23, selenium 26.

Carbonate.—Green, blue, dark blue. Crystallized, often with blackish green. Massive, botryoidal, stalactitic, plumose, striated. Fracture—conchoidal, fibrous. The massive green contains 70·2 peroxide of copper; the blue carbonate is generally crystallized; stated to contain 69 peroxide of copper.

The other ores of copper are white, yellow, red, grey, blue, green, and black, and with or without metallic lustre. Massive, pulverulent, chalky.

I. For sulphurets, and those called white, yellow, purple, and black ores, digest repeatedly one part of the pulverized ore in three times its weight of dilute nitric acid, till it extracts no more copper, *i.e.* until the fluid acquires no blue colour, when liquid ammonia is dropped into it.

II. Evaporate the solution to dryness, re-dissolve in concentrated nitric acid; repeat this process several times.

III. Boil the dry mass in eight times its quantity of water; a brown powder becomes separated; this is the iron contained in the ore.

IV. Mingle the fluid from which the iron has been separated, with a solution of potash, till no further precipitate ensues; boil it for a few minutes, collect the precipitate, dry it in a red heat. 100 contains 80 of copper.

Solutions of copper with muriatic acid—green.

Solutions of copper with nitric acid—bluish, or blue.

By adding a little ammonia, a green precipitate falls, and quickly becomes deep blue, which is a deeper blue, and has a sort of reddish tint, which that produced by nickel has not.

A rod of zinc, or a polished plate of iron, throws down copper in the metallic state.

Blow-pipe.—Fused with borax, the salts of copper give a green colour to the outer flame, and a dirty brownish red to the *interior* flame.

IRIDIUM.

This metal is white, requires high temperature to fuse it. Never obtained yet in any other state than powder. It is but little known; and will only dissolve in aqua regia, where a quantity of platinum is mixed with it; but it will not dissolve *per se* in any acid, not even in aqua regia. The solution is *dark red*, or dark reddish brown.

Potash turns the liquid to a dirty green, and gives a very little brownish black precipitate, and when heat is applied, the mixture gradually assumes a blue colour, which gets deeper and deeper.

When the blue liquid is evaporated, a slight bluish precipitate at first falls, but the dry mass is white, with a tint of green.

MANGANESE.

Grey Oxide.—Colour—of a steel-grey, passing into iron-black; and occurs in prismatic crystals. Cleaves readily, and with brilliant surfaces, parallel to the lateral planes, also in acicular crystals, longitudinally striated, either in a diverging or confusedly intersecting each other. It also occurs *massive*, with a fibrous structure, or of a granular, or earthy texture. Soft, brittle, giving a black dull streak. When *pure*, it gives up, on being heated, $\frac{1}{11}$ of its weight. Occurs—in primitive and secondary countries, in veins, beds, and irregular masses.

Contains—by Klaproth, 90·5 brown oxide of manganese.

Compact.—Steel-grey, passing into black, with a shining, and often of a semi-metallic lustre. Botryoidal, stalactitic, massive, hard, unyielding to the knife.

Earthy Wad.—Various shades of brown, blackish brown, and grey, approaches to steel-grey. Contains 83 oxide of manganese.

Siliciferous Oxide.—Massive, pale, pinkish, brown, reddish, or yellowish brown, brownish black.

Di-Silicate.—Colour—iron black. Massive and crystallized octohedron.

Sulphuret.—Of a brownish black colour, but when fresh fractured, of a dark steel-grey. Massive, botryoidal, with shining metallic lustre. Fracture—fine-grained. Stated by Klaproth to contain 82 oxide manganese.

Carbonate.—Colour—rose-red, translucent, and consisting of aggregated crystalline masses, possessing a lamellar structure. Manganese 48.

Red Oxide (Haussmanite).—Massive and granular, crystallized. Colour—brownish black.

Digest 100 grains in muriatic acid until solution takes place. The solution being evaporated to dryness, and re-dissolved in water, acidulated with muriatic acid, leaves the silica, which is collected.

The solution, thus freed from silica, is tested for iron and barytes.

Should iron be found, it must be peroxidized, and thrown down by benzoate of ammonia. Barytes is thrown down by sulphate of soda or ammonia. The sulphate of barytes is to be washed, dried, ignited, and weighed.

The manganese precipitated by caustic ammonia, washed, dried, and ignited, will be in the state of red oxide, 4·833 = 5 grains of sesquioxide.

Manganese, 3·5
Protoxide, 4·5
Sesquioxide, 5
Red oxide, 4·833
Deutoxide, 5·5.

MERCURY.

Native.—Colour—silver-white. Splendent lustre. Occurs in globules easily separated.

It occurs in most of the deposits of the ores of quicksilver.

Amalgam.—Of a greyish silver-white. Occurs in a semi-fluid state. Also massive, and variously crystallized, soft, heavy.

Clean warm copper, *rubbed on it*, becomes metallic white. Found with the ores of mercury. Contains—64 mercury, and 36 of silver.

Sulphuret (Cinnabar).—Colour—various shades of red, bright red, or reddish brown, to grey. Occurs—massive and crystallized. Structure—lamellar, curved, granular, glimmering, or quite dull and opaque.

Contains—84·5-quicksilver.

Hepatic (Cinnabar).—Very dark, reddish grey, or iron-grey. Compact and slaty, fine-grained, sectile. It is sometimes found mixed with bituminous shale. Contains 81 quicksilver.

Found in clay-slate, and secondary limestone, also in sandstone, and the slate-clay of the coal formation.

Muriate.—Colour—greyish white, grey, yellowish and greenish grey. Massive, tubular, and in quadrangular prisms. Lustre—between adamantine and vitreous. Contains—75 oxide of mercury.

This, dissolved in pure water, will be precipitated orange by *lime*-water.

Mercury is best soluble in nitric acid. Solution colourless. Prussiate of potash occasions a *white gelatinous precipitate*.

A plate of copper throws down the mercury in the metallic state.

Chromate of potash throws down a *red* precipitate.

If carbonate of soda be mixed with salt of mercury, and the mixture heated to redness in a glass tube, shut at one end, running mercury sublimes, and coats the table in the form of a grey powder, which forms globules of mercury when rubbed with a glass rod.

NICKEL.

Until very lately, Nickel has been disregarded. It is now very dear. Its ores are few, and not very commonly met with.

Arsenical Nickel.—Colour—copper-red, or yellowish red, of various shades. Mostly massive, but also botryoidal, reticulated, dentritic. Fracture—fine-grained, imperfect, conchoidal. Hard and brittle. Different specimens give variable results, from 44 to 86 of nickel.

Found in primitive and secondary rocks, accompanying the ores of cobalt, copper, and silver.

In Cornwall this has been taken for "Red Mundic." It has been

found in several countries in Europe, and various counties in the United Kingdom.

Arseniate of Nickel.—Colour—pale green. Coating and investing, sometimes compact, also friable, with a greenish white. Occurs in similar rocks, and with various ores, as the above. It is stated to contain 78·6 of arseniate of nickel.

Distinctive character.—Mix arseniate of nickel with potash, and ignite in silver crucible. The acid unites to the potash; the oxide of nickel remains. Water removes the potash and the arsenic acid; the oxide of nickel remains.

The oxide of nickel, in ammonial solution, is quickly decomposed by adding potash, and by this nickel is obtained from any cobalt in the solution, because the oxide of the cobalt, slowly and sparingly dissolved in ammonia, is very sparingly precipitated by the potash, but the oxide of nickel is *quickly* dissolved, and immediately precipitated.

If, to the *nitric* solution of copper and nickel, ammonia be added, a slip of zinc will then precipitate the copper, but will have no effect on the nickel.

PLATINUM.

Is found in the metallic state, alloyed with other metals.

Native.—Colour—between steel-grey and silver-white (whence its name, in allusion to its colour). Hard, but malleable. Infusible, commonly found in lumps, and smallish grains about the size of peas, smaller or a little larger.

It is found in Peru, Brazil, Siberia, and other places, with gold and palladium, and accompanied by iron, copper, lead, with magnetic iron-sand, with grains of gold; generally found with iridium, rhodium, osmium, &c.

It is best dissolved in aqua regia, and produces a dark reddish brown solution.

Prussiate of potash throws down yellow precipitate, and the *liquid* assumes a *deeper* colour.

When a red heat is applied to the chloride of platinum, the chloride is driven off, and the metal remains in grains, or in a spongy state.

In a glass or test tube of distilled water, let in one drop of muriate of platinum, then add to the mixture a drop or two of submuriate of tin; a dense *orange-colour* precipitate will fall down.

SILVER.

Native Silver.—Pure white. Shining metallic lustre. Generally found tarnished, yellowish, brownish, or blackish. Occurs—massive, stalactitic, cellular, reticulated, dentritic, arborescent, capillary, crystallized, *cube*, and octohedron. Very commonly contains gold.

Occurs—associated with the ores of silver, arsenic, cobalt, bismuth, tin, copper, iron, zinc, lead. Found in various primitive, transition, and floetz rocks, in clay, porphyry, and in limestone and sandstone.

Antimonial Silver.—Nearly silver-white, but often tarnished buff, or yellowish. Occurs—massive, in grains, and investing with ores of lead, antimony, zinc, nickel, copper, &c. &c. Contains—silver 84, antimony 16.

Arsenical Silver.—Nearly colour of native silver, tarnished blackish. Found—massive and investing, and in small globular and reniform. Brittle, and easily frangible. Contains—12·75 silver, arsenic 35, iron 44.

Molybdec Silver.—Of a light steel-grey, passing into tin-white, but sometimes inclining to lead-grey. Occurs in crystallized masses (six-sided prisms). Soft, and somewhat elastic. Powder, iron-black.

Bitelluret of Silver.—Colour—lead-grey, and light steel-grey. Massive, metallic, splendent.

Sulphuret of Silver.—Colour—dark lead-grey, occasionally nearly black, and faintly glimmering, exterior sometimes tarnished. Soft and malleable. Crystallized, massive, pulverulent, disseminated, and investing. Occurs—with lead, cobalt, copper, &c. &c. Contains—85 silver, 15 sulphur.

Ruby Silver, Light Red Silver.—Dark lead-grey to iron-black. Massive, micaceous, dentritic, crystallized. Contains—silver 60, antimony 20.

These ores accompany the other ores of silver, and those of copper, lead, &c.

Muriate of Silver (Horn Silver).—Pearl-grey, greenish or reddish blue, or brownish. Massive, and crystallized in small cubes, and investing and acicular prisms. Translucent or opaque, waxy lustre. Occurs—with the other ores of silver, and frequently escapes notice. Contains—88·7 muriate of silver.

This, on being rubbed with a piece of moistened zinc, shows a thin film of metallic silver.

Carbonate of Silver.—Colour—greyish, passing into black. Occurs—massive and disseminated. Fracture—fine-grained. Soft, brittle, heavy. Found in granite, accompanying native silver and sulphuret. Contains—silver 72·5.

Bismuthic Silver.—Light grey, metallic, sometimes of a deeper colour. Usually disseminated, but sometimes massive. Soft, sectile, and somewhat brittle. Contains—silver 15, bismuth 27, lead 33.

Sulphuret of Silver and Copper.—Colour—of a deep grey. Massive, with shining lustre. Surface brilliant, granular, and partly conchoidal. Very brittle, and readily fusible. Contains—sulphuret of silver 60·65, sulphuret of copper 38·65. The colour is between lead-grey and iron-black, tinged red. Wheal Jubilee, St. Izzy, Cornwall.

White Silver.—This varies much in character. Its general colour is light steel-grey, and from this nearly to black. Occurs—massive and disseminated, often associated with cubic galena. Fracture—even, fine-grained, with glistening lustre, sometimes nearly like plumose antimony. Soft, and somewhat brittle. Light grey; 20·40 silver, 48 lead, 7·88 antimony. The darker nearly the same ingredients.

Seleniuret.—Colour—light shining lead-grey. Granular texture, and yields very readily to the knife. Contains—38·93 silver, copper 23·05, selenium 26·00. Occurs—with seleniuret of copper and copper pyrites. Blow-pipe—melts, and gives out strong odour like horseradish.

Having a compound suspected of containing silver, if *ore*, first pulverize very fine (the *metallic compounds* will not pulverize), and digest the mineral compound in nitric acid. Filtrate the solution, and let it stand; add muriatic acid by degrees, or a solution of common salt, previously dissolved in distilled water. The silver, if any, will be thrown

down as the muriate of silver, in the shape of a white curdy precipitate, which is insoluble in dilute acids, but is soluble in ammonia.

The sulphate of iron throws down the silver in a metallic state.

TELLURIUM.

Native Tellurium.—Colour—tin-white, with a shining metallic lustre in crystalline grains aggregated. Solitary or disseminated; foliated, easily fusible.

Found in veins in porphyry with iron pyrites, quartz, &c., alloyed with silver, lead, bismuth, &c.

Graphic Tellurium.—Colour—steel-grey, approaching tin-white, splendent or tarnished externally. Occurs—in small crystals generally so arranged as to present the appearance of writing; it is brittle, and yields easily to the knife. Contains—tellurium 60, gold 30, silver 10.

Found as above with iron pyrites, quartz, calcareous spar, native gold, iron pyrites, &c.

Blow-pipe—dark grey metallic globule, brilliant and malleable.

Yellow Tellurium.—Is found silver-white, passing into yellow and *grey* of different shades. Occurs—in small crystals, bright metallic lustre. Consists of tellurium 44·75, gold 26·75, silver 8·5, lead 19·5.

Found in porphyry, with gold, native arsenic, sulphuret, manganese, &c. &c.

Black Tellurium.—Colour—between dark lead-grey, and iron-black. Occurs—crystallized, yields easily to the knife, and is sectile, and in thin laminæ, is flexible.

Tellurium dissolves readily in nitric acid. Solution colourless. The oxide of tellurium best dissolves in aqua regia.

Carbonate of ammonia throws down an abundant white precipitate, soluble in excess of the precipitant. An excess of carbonate of potash strikes a green colour, which disappears on boiling the liquid, and does not again show itself.

TITANIUM.

This metal is very little known, it is something the colour of copper, but redder, very hard, and brilliant.

Anatase (Oxide of Titanium).—Occurs—in small crystals of the acute octohedron, by reflected light of various colours, as blue, clove-brown, reddish brown, or steel-grey. The structure is lamellar, fragments splendent and adamantine, varying from semi-transparent to opaque. By exposure to heat, the yellowish brown crystals turn deep blue.

Rutile (Oxide of Titanium).—Colour—reddish brown, in four or eight-sided prisms, geniculated, often striated, sometimes in reticulated crystals.

It occurs in the vein of the primitive rocks, with the ores of tin, with spathose, iron, &c., and often penetrates quartz, by slender hairs or thin wires. Red by transmitted light. In many places in England, Wales, and Scotland.

Titan (Nigrin).—Colour—brownish black. In small loose angular masses; lamellar, lustre, shining or glimmering opaque, brittle. Found in primitive rocks, in debris of granite (Ceylon), fragments of granite with hyacinth, gold, rutile, oxidulated iron, &c. Said to contain 84

per cent. oxide of titanium. With borax, it melts into a *hyacinth-red glass.*

Titanium is very difficult to dissolve in acids; but, if first heated with *caustic potash or soda*, it is readily oxidized, and converted into titanic acid. When precipitated by alkali, from *muriatic acid* solution, washed, and then ignited, it forms lumps of light brown colour of great lustre.

When titanic acid is heated to redness, it becomes *lemon-yellow*, which gets *white on cooling.*

In obtaining the acid solutions of titanic acid, do not use heat; *muriatic* acid is best.

The tincture of nutgalls throws down an orange-red precipitate: this is characteristic of titanium.

Menachanite.—Of a grey or iron-black colour. Occurs—in small angular grains. Structure—imperfect lamellar. The fracture fine-grained, even glistening lustre, between adamantine and metallic.

Found in St. Kevern, St. Stephen's, and other places in Cornwall. Contains 45 oxide of titanium, 51 oxide of iron. It has been found in Australia, New South Wales.

Iserine.—Of an iron or brownish black. Occurs—in grains or rounded pieces, of a deep black internally, the structure lamellar, cross fracture, conchoidal, with brilliant semi-metallic lustre, very hard. Stated at 48 oxide of titanium, and 48 oxide of iron. Has been found in Silesia, in Aberdeenshire, in Scotland, and Dr. Trail states, "it oozes out of a bed of cohering sand, on the shore of the Mersey, at Seacombe Ferry, opposite Liverpool."

Sphene.—Colour—greyish, yellowish, reddish, blackish brown, various shades of green, bluish, and greenish white. Amorphous, and when pounded is greyish white, also in crystals of various forms. It is found in primitive rocks, in various countries, and in Ireland, Scotland, Shetland, and Cornwall. Contains—35 oxide of titanium, 35 silex, 33 lime.

On proper trial, it is likely that some valuable pigments may be obtained from the oxides of this metal.

TUNGSTEN.

Tungstate of Iron—Woolfran.—Found in the tinstone of the veins and beds of Saxony, Bohemia, and Cornwall. Colour—greyish and brownish blue. Massive and in crystals, right oblique-angled prisms. Fracture—uneven; imperfect metallic, opaque. In elevated temperature, melted into globule, and the surface covered with small crystals of metallic lustre.

Fuses with borax into *green* globule, melts with biphosphate of soda, into a *deep red transparent* bead.

Tungstate of Lead.—Very similar to the brown phosphate of lead. It is neither frequent nor plentiful.

Tungstate of Lime.—Colour—yellowish white, grey-white. Occurs—amorphous and crystallized.

Found in primitive rocks.

Tungstate of lime often resembles carbonate and sulphate of lead, and heavy spar. It is distinguished from the two first ores by not effervescing in acids; and from the last, by the yellow colour it assumes when [illegible] in nitre.

TIN.

Oxide.—Peroxide sometimes (rarely) occurs massive, fibrous, granular; generally crystallized.

Colour—all shades from light brown towards black, and sometimes in Cornwall the oxide of tin is met with in *quite white, semi-transparent, and translucent sparkling glass-looking crystals;* but very few, either of the miners or mine-captains, know much about the gangue, and matrices of the tin-veins. Tin is the only mineral which attracts the care or the attention of the miner. The tin-veins sometimes contain very considerable quantities of silver, and other valuable minerals, but all is wasted; nothing but the tin is attended to.

The oxide of tin belongs almost exclusively to the oldest of the primitive mountains, but not to the oldest granite. It is found in veins and beds, and often disseminated in certain descriptions of granite. In Bohemia and Saxony, it is often in beds alternately with granite. It is stated by Klaproth to contain 77·5 tin, and 21·5 oxygen.

Tin Pyrites (Sulphuret of Tin).—It is massive. Colour—steel-grey, yellowish white, or yellow, and dead buff, and often all these shades are in blotches in the mass. Fracture—granular and uneven, passing into conchoidal, of a shiny lustre. It yields to the knife.

It has been worked in Wheal Rock, in Trewanance, in St. Agnes, and in Wheal Scorier, and is more frequent than is generally supposed. Constantine, Stenna Gwynn, St. Neot's, St. Stephen's, and other places. Commonly taken for "mundic." Contains 34 tin, 36 copper, 25 sulphur.

Blow-pipe.—When finely pulverized, it is reducible on charcoal, by continued action, to the metallic state.

Various minerals have been taken as the oxide of tin, axinite, woolfran, &c. &c. The "clean tin" is not soluble in any acid, even if fused with carbonate of soda; but if five times its weight of caustic potash be mixed with it, and then ignited for a considerable time, near an hour, in crucible, the mass may then be dissolved in *muriatic* acid; then sulphureted hydrogen is passed through (the solution having been previously concentrated, and then diluted with water) as long as precipitate falls. The oxide of tin is then thrown down by caustic ammonia. The oxide of tin, in muriatic solution, may be precipitated in a metallic state by leaving a cylinder of zinc in it for some days. Collect, dry, cover with charcoal, and melt in crucible.

ZINC.

Native Zinc has not been found in a metallic state.

Sulphuret of Zinc (Blende, Black Jack).—Colour—brown, red, yellow, blackish brown, reddish black, also lead-colour. Occurs—massive, mamillated, fibrous, and crystallized. The structure is perfectly lamellar. It is transparent or opaque, and yields to the knife. Some of these blendes contain lead, silver, copper, gold, and arsenic.

Found in primitive and secondary rocks, and very commonly in the veins of lead, copper, and also with iron, tin, &c.

Contains—from 40 to 68 of zinc, and from 25 to 36 sulphur.

Red Oxide.—Colour—various shades of ruby-red, ruby or blood-red.

It occurs massive, investing, and micaceous, with shining lustre. Structure—lamellar, translucent.

Contains—88 oxide of zinc.

Blow-pipe.—All the above are infusible, without addition.

Silicious Oxide (Electro-Calamine).—Brown, greyish, bluish, yellowish white, also tinge of green, brownish, and blackish, externally, and irridescent. Massive, botryoidal, stalactitic, and crystallized. It is generally opaque, sometimes transparent. It yields to the knife, but is *much harder than the carbonate* of zinc. Oxide of zinc, 66.

Carbonate of Zinc.—Colour—mostly greyish, yellowish, or greenish brown. Occurs—compact, pseudomorphous, earthy, reniform, striated, cupriferous, and crystallized.

Contains—from 62 to 65 oxide of zinc.

Earthy Calamine.—White, greyish, or yellowish white. Dull and opaque. Occurs—massive, disseminated, and investing, and pseudomorphous. Commonly found in the shape of dog's-tooth spar, and generally externally dull and brownish. Calamine occurs in beds and veins in secondary limestone, commonly in lead veins and conglomerate rocks.—

Contains—from 64 to 71 oxide of zinc.

Sulphate.—Greyish, yellowish, reddish, and greenish white. Massive, stalactitic, botryoidal, investing. Structure—fibrous and radiated. Shining, translucent. Soft and brittle.

It is generally found with blende, and some think it arises from its decomposition; but it sometimes occurs without blende, in Flintshire and in Cornwall.

Oxide of zinc, 27—Sulphuric acid, 22.

Liquid ammonia into the solution of zinc produces a white precipitate, which again dissolves by adding additional quantity of the test.

The sulphurets may be very finely powdered, and then digested in strong nitric acid until dissolved; then the oxide of zinc may be thrown down by carbonate of soda at boiling heat.

LIVES OF EMINENT ENGINEERS.

It has been announced as part of the plan of the present work to give memoirs of eminent engineers, as illustrative of the progress of practical science. Perhaps we could choose none so appropriate as Watt, Trevithick, and Stephenson, and to whom the mining interest, as patrons of this work, are especially indebted. Watt, by the improvement of the low-pressure engine, gave vast resources to the miners of Cornwall and the coal-basins. Trevithick, by the invention of the high-pressure engine and the locomotive, gave no less impulse, and he enabled the steam-engine to be applied to the silver-mines of the mountainous regions of Peru. Stephenson, by inventing a safety-lamp, and by improving the locomotive engine, rendered two great services, while the latter has operated most powerfully in the development of the coal-fields and limestone quarries. Trevithick was a

pupil of the great mining school of Cornwall, Stephenson of that of Newcastle, each the head of his school.

As the life of Watt is well known—we have confined ourselves to a short sketch. For the lives of Trevithick and Stephenson we are indebted to Hyde Clarke, Esq.

LIFE OF JAMES WATT.

BY THE EDITOR.

James Watt, the subject of our notice, was born at Greenock, in Scotland, in the year 1736, where he was educated at the grammar-school, and at the age of sixteen apprenticed to a mathematical instrument maker, within two years after which he came to London, but subsequently returned to his native place. At the age of twenty-one we find him resident in the University of Glasgow, he having been appointed philosophical instrument maker to the College, where he remained for seven years, until the year 1764, when he established himself as an engineer, and was one of those consulted in the construction of the Caledonian Canal. It was about this period that his mind appears to have been more especially directed to the application and power of steam, arising from his having been engaged in repairing a model of a steam-engine constructed on the principles of Savery, by Newcomen and Cawley, a patent for which had been taken out at so distant a period as 1705. The model belonged to the class of natural philosophy in the College, and Watt tried various experiments for its efficient repair. After having devoted nearly four years to these and subsequent investigations, we find that in 1768 he completed his first engine, which differed from that of the model by the condensation of the steam taking place in a second vessel, so that the descent as well as ascent of the piston was produced by the force of the steam, and not by atmospheric pressure, as in the engine of Newcomen. It was not, however, until 1769 that he secured his first patent, having been materially assisted, in a pecuniary point of view, by Dr. Roebuck, in accomplishing his object, and effecting those several improvements to which he was prompted in the course of his experiments. It being found that the steam, in coming in contact with cold water, caused a loss of two-thirds of the fuel by condensation, Watt introduced a wooden pipe or tube instead of iron, considering the wood as a worse conductor of heat. This, however, had not the desired effect, as the wood was found to present less resistance to the sudden changes of temperature. With a view of counteracting the obstacles which thus presented themselves, he determined on passing the steam through an iron tube without cooling the walls or outer surface, and which may indeed be said to constitute the invention of the condenser. A small air-pump was also applied, which was worked by the piston, so as to get rid of the water in the condenser,—this being Watt's first great improvement. His second was that of enclosing the metal tubes in wood, so as to retain the heat, and admitting the steam above and below the piston, as it required to be depressed or raised, calculating with a degree of nicety the fuel necessary for producing a certain quantum or power of steam, and the volume or quantity of cold water required to condense it. At this time, however, it is to be regretted that Watt possessed not sufficient means for extending the utility of his discoveries. About seven years afterwards, Dr. Roebuck, who had become reduced in circumstances, disposed of his interest to Mr. Matthew Boulton, of Birmingham.

Watt having thus become associated with Boulton, active steps were taken for the construction of a steam-engine at their manufactory at Birmingham, which all connected with the mining interest were invited to visit, and which at the time excited much interest. Cornwall, which has made such great advances in

the application of steam, and in the economy of working, whether as regards the saving of fuel or the greater power applied (and of which some comparative tables, with statistical details, will be found in our present volume), was the first duly to appreciate the advantages attendant on the improvements which had been so ably and successfully introduced.

We need hardly say, that as its advantages became more apparent, it gradually superseded the engine of Newcomen, which had been previously employed. The terms upon which the engine was supplied afford a good illustration of the superior mind and general liberality displayed by Watt and his partner. These were, that one-third only of the saving of fuel over that used by the old engine should be the price of the new one, thus at once demonstrating the confidence they entertained in the success of the latter, and which has been since that period so fully verified.

A very ingenious method was resorted to for ascertaining with precision the difference in the consumption of fuel, and as an instance of which it may be observed, that in one year alone, at the Chasewater mine, a saving of no less than 7,000*l.* was effected in the space of twelve months in the working of three engines, which, assuming them to be of similar power, would be equal to the saving of fuel of one, or 2,333*l.*, which was the amount paid to the firm of Boulton and Watt as their proportion, being one-third of the advantages attendant on the saving.

This liberality did not, however, meet with a good return, for a combination was formed to resist payment of the dues, and which succeeded in invalidating Watt's patent. Nevertheless, Boulton and Watt succeeded in establishing a great business, and obtaining profitable results. On the whole it may be said there were advantages attendant upon the liberal policy observed by Watt and Boulton, but which is rarely followed in the present day. Too frequently have we found the expectations of the projector foiled, and the benefits which might attend the adoption of his invention or improvement completely marred, simply from the circumstance of exorbitant terms being required. Neither is it rare to find instances of want of liberality evinced on the part of those who have so much to expect from a connection formed with the capitalist, without whose aid it must in all probability lie dormant, unprofitable, and eventually be sacrificed.

An extension of Watt's patent was obtained in 1800, up to which period the engine had only been employed to raise water; and having applied himself to the consideration of the best mode whereby it might be applied to the working of mills and other objects of a like nature, he invented that which is generally termed the sun and planet motion, whereby the object was attained.

If we name these as his chief works, it is not that his industry was limited to them. Indeed his inductions and discoveries embraced a wide field of knowledge which few men exceeded; and his share in discovering the composition of water gives him a place in the annals of natural philosophy, as his numerous other labours do in those of mechanical science. He was a student to the last days of a long life, and there was no branch of literature or science in which he was not proficient.

He was a Fellow of the Royal Societies of London and Edinburgh, and the Institute of Paris also elected him one of their eight foreign associates. James Watt died on the 25th August, 1819, aged 84 years.

Few Englishmen have ever received greater testimonies of the esteem of their fellow-countrymen, and few have so well deserved them for the lasting and practical nature of the services they have performed, and from which, in his case, our latest posterity will benefit. The chisel of the sculptor, and the pen of the writer, have both at home and abroad been applied to celebrate his services and record his fame, and there has been a generous emulation in the expression of public gratitude.

An *éloge* has been published by M. Arago, translations of which have been written by Mr. Muirhead and Mr. Hyde Clarke, and a paraphrase by Dr. Lardner. These give all the details of Watt's life and works.

LIFE OF RICHARD TREVITHICK, C.E.

BY HYDE CLARKE, ESQ.

RICHARD TREVITHICK was the son of a Cornish engineer, and born, we believe, at Camborne, in Cornwall. He was brought up for the pursuits he followed, in the usual way, as a clerk or assistant in the mine counting-house, having as one of his colleagues Richard Griffiths, now the chief government engineer in Ireland.

Shortly after 1790, he joined and assisted William Bull, a Cornish engineer. Bull had been a workman engaged in erecting Watt's engines in Cornwall,* and when the warfare of the mine-owners began to defeat Watt in his patent rights, Bull was one of the engineers employed to fight the battle, and construct engines, which should be beyond the patent. Having obtained the assistance of Trevithick, many engines were made under their united direction, and erected in the county. In 1792, Trevithick was employed to report on one of Hornblower's engines at Tincroft mine, near Redruth. On this he reported, that the duty of Hornblower's engine was as 16 to 10 over Watt's.

At this time the most bitter feeling prevailed in reference to Watt's patent rights. The mine-owners, when they had derived the benefit of the improvement, grudged the remuneration, and the Cornish engineers, with the strong local feeling which then prevailed, looked with anything but pleasure on the intrusion of foreigners in what they considered their country. The Cornish engineers participated to some extent in this feeling, and were arrayed, as a man, in the contest with Watt, in which they were made the tools of the dirty and greedy practices of the mine-owners. The Watt party were able to retaliate in time, and their northern adherents have exercised a serious retribution; for wherever the name of a Cornish engineer comes before them, they never fail to decry his claims, and to blacken his reputation. This in a great degree accounts for the neglect of Trevithick, whose share in the Watt quarrel was never forgiven or forgotten, particularly when he became the decided champion of the high-pressure system.

The history of the Cornish engineers, with the exception of Mr. Stuart's "Anecdotes of the Steam Engine," an excellent and impartial book, has been written only by the Cornishmen themselves, and the valuable treatise, by Professor Pole, on the Cornish Engine, the Appendix G. to Weale's "Tredgold," must be looked upon as a Cornish work. Thus, but scanty and partial justice has been awarded to such men as Richard Trevithick, Arthur Woolf, Jonathan Hornblower, Andrew Vivian, Jabez Carter, Henry Vivian, Captain Joel Lean, and William Sims. On the life of Richard Trevithick no book has yet been published, and there are only two memoirs by the author of the present, one in the second volume of the *Civil Engineer and Architect's Journal*, and one in the fifth volume of the *Railway Register*, though we hope this will be supplied, as the Institute of Civil Engineers have offered a prize for a memoir of the great engineer.

After Trevithick's partnership with William Bull had come to a close, he engaged in another with Andrew Vivian, an engineer. Andrew Vivian is said to have been a cousin of Trevithick's, and was the monied partner in

* Pole on the Cornish Engine, Appendix G. to Tredgold, p. 37.

the concern, which was carried on at Camborne. In 1802, Trevithick and Vivian, in co-partnership, took out a patent for the application of the high-pressure principle in the steam-engine. This is the era from which the high-pressure engine, in its various forms, takes date, and it deserves a little attention at our hands.

This patent is also the first one taken out for a locomotive engine, and the specification is dated March 24, 1802. The patent is described "as for improving the construction of steam-engines, and the application thereof for drawing carriages on rails and turnpike roads, and other purposes." It is said that their engine will produce "a more equable rotary motion on the several parts of the revolutions of any axis which is moved by the steam-engine, by causing the piston-rods of two cylinders to work on the said axis, by means of cranks, at a quarter turn asunder." The steam was proposed to be worked either at high-pressure or not.* If the former, at a pressure from 60 to 80 lbs. on the square inch, and the boiler was made of a cylindrical form, to bear the expansive action of strong steam, having a bent tube, like the letter U, within it, to increase the heating surface. The furnace was placed within the boiler, as now in the common marine boiler. To get a greater draught in the smoke-flue, it was proposed occasionally to blow the fire with bellows, worked by the piston or crank of the engine. The cylinder of the engine was immersed in the boiler, as has since been frequently done.

As a provision against explosion, when high-pressure steam was used, a *second* safety-valve was provided, not under the control of the engine-driver, a plan which is now adopted with every locomotive engine.

The introduction of Trevithick's improvement gave increased power to steam, and it is of that importance, that Stuart, no mean authority on historical points, and not likely, from national sympathy, to underrate low-pressure, or overrate high-pressure, is inclined to date the era of the steam-engine from this invention.† In the establishment of the locomotive, in the development of the powers of the Cornish engine, and in increasing the capabilities of the marine engine, there can be no doubt that Trevithick's exertions have given a far wider range to the dominion of the steam-engine than even the great and masterly improvements of James Watt effected in his day.

That Trevithick's application was original there can be no doubt. He had never heard of Leupold, nor of Oliver Evans, nor was he likely to do so until the close of his life. It is the opinion of the best authorities—and it is only contested, without any reason assigned, by Dr. Alban—that Trevithick was the true inventor of the high-pressure system.

Watt conceived the application of high-pressure steam, but was unable to carry it out; he also, in 1769, conceived the use of the locomotive, but never attempted to make one. In 1787, Symington is said to have shown a model. A little later, William Murdoch, then living at Redruth, likewise constructed a model. This, no doubt, Trevithick saw. Oliver Evans also had an idea of applying steam for locomotion. The first locomotive, however, which was made, was that by Trevithick, and it was run by Trevithick and Vivian from Camborne to Plymouth. On the road, whilst the vehicle was at the top of its speed, and had just carried away part of the rails of a gentleman's garden, Captain Vivian saw ahead of them a closed tollbar, and called to Captain Trevithick, who was behind, to slacken speed, which he did, and at length came dead up on the right side of the gate, which was opened, like lightning, by the toll-keeper. "What have us got to pay here?" asked Captain Vivian. The poor toll-keeper, trembling

* Ritchie on Railways, p. 205.

† Historical and Descriptive Anecdotes of the Steam Engine, by R. Stuart.

in every limb, and his teeth chattering in his head, strove to answer, "Na-na-na-na." "What have us got to pay, I say?" "Na—noth—nothing to pay! My de—dear Mr. Devil, do drive on as fast as ever you can! Nothing to pay!"*

On arriving at Plymouth, the carriage was shipped in a vessel belonging to a Captain Vivian, and carried to London, where it was run in the streets.

The engine used was about the size of an orchestra drum, and was attached to a phaeton, between the back wheels. With this carriage an experiment was made in Lord's cricket-ground, at Marylebone, several men of science alternately steering it, and expressing their perfect satisfaction as to the ease with which it was directed.† Hence it was steered down the New Road, and Gray's Inn Lane, to the coach-builder's whence the phaeton had been obtained. Thus, as has been remarked, it passed over ground since the site of Hancock's experiments, and perhaps destined, in the end, to witness the great triumph of steam locomotion on the common road. The day after the first trial, Trevithick took the small engine, and exhibited it in a cutler's shop, working the machinery, which was part of his course of experiment, to show the applicability of the principle for various purposes.

At a subsequent period a temporary tram-road was constructed within an enclosure, on the ground now occupied by Euston-square and the London and North-Western Railway, close to that spot where the genius of a Stephenson was one day to complete the triumph of the railway locomotive system. We hope the day is not distant when, on the magnificent propylæum of the terminus, we shall see statues of Trevithick and Stephenson looking down on the scene of their peaceful glories.

The tram-road was opened to the public as an exhibition, and on the road, which was of an elliptical form, Trevithick ran his locomotive. Crowds went to see him; but on the second day, Trevithick, in a freak, removed the engine and closed the place. This he is said to have done under the impression that it was better to let the affair drop until he saw a fitting opportunity to avail himself of it advantageously.†

In 1804, Trevithick and Vivian constructed a locomotive for the Merthyr Tydvil Railway, in South Wales, to move railway-carriages. It was the first railway locomotive. The cylinder was placed horizontally, as in locomotives now used. The heads of the piston-rod and connecting-rod were divided, or forked, leaving room for the motion of the extremity of the crank, and giving motion to it, fixed on an axle-tree; on this axle cog-wheels were placed, working into cog-wheels on the axle of the hind wheels.‡ This locomotive engine had only one cylinder of eight inches diameter; whereas, since, the power of the locomotive has been increased to two cylinders of eighteen inches diameter. In most essential particulars, this engine resembled those now in common use.§

At its first trial, Trevithick's locomotive drew, on a level plane, as many carriages as carried ten tons of bar iron a distance of nine miles, without requiring any fresh supply of water, travelling at the rate of five miles an hour.

Trevithick sent another locomotive to Mr. Blackett, at Wylam, the birthplace of George Stephenson, but this, likewise through some blunder, failed, and was set to blow a cupola in an iron-furnace. In 1814, Mr. Blackett made another, on the same plan, which worked, and on which George Stephenson founded his improved plan.

* Coleridge's Six Months in the West Indies.
† Civil Engineer and Architects' Journal, vol. 2, p. 94.
‡ Ritchie on the Steam-engine, p. 207.
§ Nicholson's Journal, vol. 12, p. 1.

In February, 1806, Trevithick, in a letter to Mr. Davies Gilbert, states that he was about to enter into a contract with the Trinity Board for lifting the ballast out of the bottom of the Thames, for all the shipping. The first quantity stated was 300,000 tons a year, but they afterwards stated 500,000 tons a year. He was to do nothing but wind up the chain, for 6d. per ton, which was then done by men, who never lifted it above 25 feet high. A man could then get up ten tons for 7s.; whereas, Trevithick considers that his engine at Dolcoath lifted above 100 tons that height with one bushel of coals.

He had then two engines already finished for that purpose, and was to be in town in about fifteen days (that is, on the 5th March, 1806*), to set them to work. The contract was to be for twenty-one years, and he expressed himself satisfied with the terms. What became of Trevithick's ballast-engines we do not know, but we believe litigation ensued.

At this time Trevithick had received orders for nine engines within a month, all for Cornwall, and he expected orders for four more.†

He was then engaged on a railway, as appears by one of his letters.

From the same source we learn that a person in Wales owed him £600 for patent premium, and disputed his patent.

About 1806, an attempt was made by Trevithick to introduce his patent engine, as a simple non-condensing high-pressure engine, for pumping and winding in the mining districts, in place of the condensing-engine of Boulton and Watt.‡ He considered that the use of his engine would obviate an inconvenience sometimes felt for want of injection-water for condensation.

In 1806—we follow Professor Pole's narration—Trevithick had a non-condensing high-pressure engine at work, for drawing ores at Dolcoath mine. This was called by the people "a puffer," from its blowing the steam off into the air. This worked well for a time, in comparison with Boulton and Watt's, but did not in the end answer the expectations conceived, so that though he received several orders for engines from the neighbourhood, it is doubtful whether he executed the orders given to him. At any rate, the non-condensing high-pressure engine was never much used.

About this time, Trevithick made the first proposal for introducing the use of high-pressure steam, worked expansively, to a greater extent than formerly, and substituting, for the common boiler, his cylindrical boiler. This is one of Trevithick's great merits.

In some of the first high-pressure engines, manufactured by Trevithick, he used the steam expansively; for in July, 1804, he alludes to the saving of coal effected thereby; but the idea of substituting high-pressure steam in the then existing Boulton and Watt pumping-engine, and of expanding it down to a low-pressure previous to condensation, seems, according to Professor Pole, whom we follow, to have occurred to him about 1806, as above stated. On the 18th February, 1806, he wrote to Mr. Davies Gilbert for his opinion on the practicability of the plan, and that opinion seems to have been favourable. Anxious to make trial of the plan, Trevithick proposed to adapt a new boiler, of his own construction, to Dolcoath great engine, and to work it with high-pressure steam expansively. He describes minutely, that "it is not intended to alter any part of the engine, or condenser, but only to work with high-pressure steam from this new boiler."

* This arrival seems to have been delayed, as intimated in another letter. See Appendix G. to Tredgold.

† See, likewise, Nicholson's Journal, vol. 11, p. 95.

‡ Pole on the Cornish Engine, p. 45, Appendix G.

As Professor Pole* remarks, Trevithick's plan would, if carried out, have produced an engine nearly the counterpart of those now used. As Trevithick was considerably in advance of his age, his suggestions were not then adopted, and the progress of the steam-engine was thus delayed until a later date. One reason which Trevithick assigns in favour of his plan is particularly worthy of observation. He gives his opinion that the momentum of the vast mass of matter the great Dolcoath engine had in motion would answer in effect the purpose of a fly-wheel, by regulating the motion of the engine. It is well known, now, that the great mass of matter in the pump-rods, balance-bobs, &c., consequent upon deeper workings, has been the principal cause, whereby the modern engineers have been enabled to use expansion to a much greater extent than formerly. This is one among the many proofs of Trevithick's great sagacity and foresight.

During the early part of this century, Trevithick spent much of his time in the metropolis, engaged in promoting his various inventions, and he secured at times the co-operation of many of the active and enterprising men of that day, who were acquainted with his merit. Among these associates of his pursuits were the Earl of Stanhope, Mr. Davies Gilbert, Mr. Isaac Rogers, Mr. Allen, of Plough-court, Mr. Henry Clarke, Mr. Knight, of Foster-lane, Mr. Taylor, Mr. Nicholson, Mr. Arthur Woolf, and many others.

Among Trevithick's undertakings were included railway and common road locomotion, draining, ironmaking, coining, water-pressure engines, mint-machinery, railways, silver-smelting, dredging-machinery, steam-navigation, expansion, tunnelling under the Thames, ships' tanks, engines of recoil, and air-engines.

In 1809, Trevithick was employed in his Thames Tunnel plan, for which a small subscription was raised among his friends for an experimental driftway, as a preliminary to show the practicability of a larger work. The driftway was to be run parallel to the bed of the Thames, and the committee of subscribers felt every assurance of the success of the undertaking, for the operation was very simple, and they had every confidence in Trevithick's ability, and his knowledge of underground works.†

This was the second tunnel attempted under the Thames, Ralph Dodd, the famous projector and afterwards partner with George Stephenson in the locomotive, having obtained an act of parliament for the first, at Gravesend, in 1799, and commenced his work, but which was soon defeated by water flowing in through fissures in the chalk.

Trevithick's tunnel was at Rotherhithe, a short distance from Brunel's tunnel. He committed the usual error of going too near the bottom of the river, the object being a close run, endeavouring to keep at the least possible distance from it, and to save labour and expense, as the funds were limited. Had his experiment been carried through, he would also have been able to give a plausible cheap estimate of the intended tunnel, leaving the increased expenses to be met as they could. Trevithick's error was not productive of much inconvenience to him, nor does it seem to have been the immediate cause of the abandonment of the enterprise, for he carried his driftway to a greater extent without impediment than Dodd did before, or Sir Mark Brunel did afterwards. It was not until he had gone 930 feet under the river,‡ that he encountered any obstacle, when he got into a hole in the muddy bottom of the river; and at one time a piece of uncooked ship-beef, which had fallen from one of the vessels, drifted into the works.

* For the account of Trevithick's discoveries in high-pressure steam, Professor Pole's book is the only authority, and he has treated the subject with the greatest ability and impartiality.

† Mechanics' Magazine, vol. 1, pp. 66, 67; vol. 3, pp. 205, 384; vol. 7, p. 365.

‡ Ibid. vol. 1.

Although the Corporation authorities refused to allow him any facilities, he managed to get this hole stopped, and again went on with vigour. He carried on the excavations at the rate of from four to ten feet per day, and soon completed a thousand feet, to the great joy of all parties concerned.

On arriving at this distance, according to a previous arrangement with the committee, Trevithick was to receive a hundred guineas, which, after the verification of the work by a surveyor, were paid to him. According to a contemporary,* and the end of which seems to be in perfect keeping with Trevithick's character, the surveyor reported to the subscribers confirming the measurement, but asserting that the line had been run a foot or so on one side. This statement, which, if well founded, was not material, Trevithick took in high dudgeon, and chose to consider it as a severe reflection on his engineering skill. His Cornish blood was excited, and, with his usual impetuosity, he set to work to disprove the assertion, without any regard to his own interests, or those of the subscribers. He is said to have adopted the absurd contrivance of making a hole in the roof of the tunnel at low water, and pushing up a series of joint rods, which were to be received by a party in a boat, and then observed from the shore. On the prosecution of this scheme, Trevithick was engaged below, and as delays ensued in fitting together the rods, the gully formed by the opening in the roof at length admitted so much water as to make retreat necessary. With an inborn moral courage, worthy of a better cause, he refused to move first, but sent the men before, and very nearly fell a sacrifice to his devotion. It has been already observed, that the driftway was parallel to the bed of the river, and therefore curved. It necessarily happened, that the water would lodge, as in a siphon, at the bottom of a curve, at which part, on Trevithick's arrival, he found so much water as hardly to enable him to escape, and as he got up the slope on the other side, and climbed the ladders, the water rose with him at his neck. Young Brunel afterwards showed a like gallantry in the other tunnel. The work thus ended after having reached 1011 feet, being within 100 feet of its proposed terminus, and is a melancholy monument at once of his folly and his skill.

On a subsequent occasion, being cross-examined as to this occurrence, while witness on a trial, he is said to have admitted the fact of ruining the works, and to have asserted his determination, in any similar circumstances, to defend his own character at whatever sacrifice to other people.

Before this time, Trevithick had brought into use his waterpower engine, one of which was long at work in Cornwall. Water was used as the prime mover.† One of these was put up at the Druid mine.‡

In the spring of 1812, Trevithick was fortunate enough to be able to put his ideas into practice, as to expansive working of high-pressure steam.§ He had occasion to erect a small engine at Wheal Prosper mine, of which he was the sole engineer, and in this engine he took the opportunity of trying the effect of the plan he had so long ago proposed. This, Professor Pole says, appears to have been the first *Cornish* engine ever erected; that is, the first condensing engine, working with high-pressure steam expansively, and having the present form of boiler. Professor Pole gives a description of the engine, with which he was furnished by Mr. Richard Hosking, of Perran Foundry, who worked it under Trevithick.

The steam-pressure on the boiler was more than 40 lbs. per square inch

* Civil Engineers' Journal, vol. 2, p. 94.
† Nicholson's Journal, vol. 1, p. 162; 2 p. 5.
‡ Mechanics' Magazine, vol. 2, pp. 15, 271.
§ Pole on the Cornish Engine, Appendix G., p. 51.

above the atmosphere, there was no throttle-valve, the steam-valve was large, and therefore when the steam was first admitted into the cylinder, it must have acted with nearly its full force upon the piston. The engine worked, under its usual load, more expansively than was customary, even with engines in modern days, except some erected within the last five years. The steam was cut off at one-ninth or one-tenth of the stroke. When, however, the load was increased, the degree of expansion was accordingly diminished, and the engine was thus made to lift, by the high pressure of the steam used, a load which had never before been thought possible, showing thereby the great advantage which the method employed would offer, in adapting the capabilities of the engine to the variable nature of the duty required to be done by it.*

Arthur Woolf also proposed a modification of the expansive principle, and took out a patent for it in 1804. Trevithick proposed his scheme in 1806, and built a Cornish engine on his plan in 1812. Woolf brought his engines into Cornwall in 1813 or 1814.† The success of Woolf's engine for some time delayed that of Trevithick's.

In 1815, on the 6th of June, Trevithick took out a patent for what he called a plunger or pole-engine. This engine succeeded very well for a time, but having been superseded by a simpler form, it did not survive. The first engine of this kind was put up by Trevithick, at Herland, in 1815, the steam being worked at a very high pressure. In writing to Mr. Davies Gilbert, he asserted its successful trial; but overrating its power, he attempted to make it command the whole water of the mine, a work which would have required two 80-inch engines of the present construction, his engine being 33-inch. As Professor Pole observes, Trevithick failed in the attempt, as he usually did when he aspired at too much. At a subsequent period, Mr. Wm. Sims purchased the patent right of this engine, and applied its principle in the alteration of several engines, which became for several years formidable rivals to the best engines in the county.

Trevithick had also invented a cylindrical boiler for the generation of steam, having an internal fire-tube. One of them he was about erecting in December, 1804, in South Wales. It was 24 to 26 feet long, 7 feet diameter, internal fire-tube 4 feet 4 inches diameter at the wide end, and 1 foot 9 inches diameter at the narrow end, being very nearly the same dimensions as in the present Cornish engines, except that the fire-tube is often made of equal diameter throughout. Mr. Pole observes that the perseverance Arthur Woolf showed in bringing his double cylinder engine into operation was chiefly effectual in stimulating the Cornish engineers to avail themselves of Trevithick's plan, by opposing it to the more complicated one of Woolf, and thus to show that it possessed advantages which they had neglected or thought improbable when Trevithick had offered them years before. Woolf himself subsequently adopted Trevithick's boiler.

Among Trevithick's modifications, was the adoption of a single cylinder for working the steam expansively. In 1816, Messrs. Jeffree and Gribble, who had been educated under Trevithick, erected a new engine with a 76-inch cylinder at Dolcoath, where Trevithick had been engineer.‡ This was a single-acting Boulton and Watt engine, but was worked with high-pressure steam expansively, supplied from boilers on Trevithick's construction. In the first year it performed 40 millions, being a much higher duty than had hitherto been reached by any single-cylinder engine. It long maintained its high character, and, singularly enough, improved as

* Professor Pole, in Appendix G., p. 52.
† Ibid. p. 54.
‡ Ibid. p. 56.

it was more used. In 1817, it reached 44 millions, and in 1819 was the best engine reported.*

One of Trevithick's plans was an improvement on steamboats by propulsion at the stern, and he suggested the use of a spiral wheel, revolving at the stern, as preferable to the use of side paddle-wheels. The modern extension of this mode of propulsion is well known. Another proposition of his for promoting steam navigation, was his revival of the plan of giving motion to the engines by means of the reaction of the steam made to spout against the atmosphere.

In 1815, he effected an improvement in his high-pressure engines, by forming the piston so that a ring of water should run all round it, and render the whole air-tight; as he found in practice that a very moderate degree of tightness in the packing produces this result.†

An engine of Trevithick's was put up to drain the marshes between Greenwich and Woolwich. This burst, through a boy fastening down the safety-valve.‡

We now come to a romantic period in Trevithick's life. Uvillé, a Spaniard, seeing the decline of the American mines, from the insufficient power of drainage in the old works, was desirous of adopting the English method of pumping by steam. For this purpose he came to London in 1814, but his efforts were baffled by the difficulty of transporting cumbrous machinery over the mountain districts, and by the diminution of power to which atmospheric engines would be subjected when worked in the rarefied atmosphere of the Cordilleras. To Watt and to other eminent engineers he applied urgently, but without success.

When on the point of departing from England, frustrated in his object, he chanced to see a finished working model of Trevithick's engine exposed for sale in the shop of Mr. Roland, in a street near Fitzroy-square. This model Uvillé carried to Peru, and, to his unutterable joy, he had the pleasure of witnessing its successful working on the high ridges of the Sierra de Pasco.

Thus encouraged in his darling plan, he entered into partnership with two rich merchants at Lima, and obtained from the Viceroy of Peru the privilege of working some of the abandoned mines. He once more started for England, and while on his voyage, talking with Mr. Teague, a fellow-passenger, of his anxiety to discover the inventor of the model, he was most agreeably surprised to hear Mr. Teague answer, that "Trevithick was his near relative, and that he could bring them together within a few hours of their arrival at Falmouth."

Accordingly, on his arrival, Uvillé proceeded to Camborne, and had an interview with the great Cornish genius, to whom no undertaking could have been offered which he would have better liked. They readily came to terms; Uvillé remained some months with Trevithick, profiting by his instructions, and, after a tour through the mining districts, proceeded to Soho, but met with no encouragement from Boulton and Watt. Trevithick then undertook to furnish the necessary engines, and set actively to work.

In September, 1814, Uvillé embarked at Portsmouth, for Lima, taking with him three engineers and nine of Trevithick's engines. The names of the engineers were, William Bull, formerly Trevithick's partner; Henry Vivian, of Camborne, a kinsman of Andrew Vivian and Trevithick; and Thomas Trevarthen, of Crowan.

Uvillé was received at Lima with the greatest honours and rejoicings,

* Lean's Historical Statement.

† Historical and Descriptive Anecdotes of the Steam-engine, by R. Stuart, p. 520.

‡ Tilloch's Philosophical Journal, vol. 16, p. 373.

and landed with his cargo under a royal salute. It was not until the middle of 1816 that he was able to surmount the local difficulties of transport, and place the first engine in operation. Trevithick, however, had nobly armed himself against the antagonist obstacles, and all that his ingenuity could suggest had been put in practice. The machinery, simplified to its greatest extent, was so divided as to form adequate loads for the weakly llama, and the beams and boilers, made in several pieces, were transported over precipices where a stone may be thrown for a league.

The engine erected at Lauricocha, in the province of Tarma, was put into operation, and, in the presence of the government commissioners, drained the first shaft of the mine of Santa Rosa, one of the Pasco district. The greatest expectations were created, and, amid the profusion of honours showered upon the projectors, nothing seemed to be wanted but the presence of the meritorious inventor himself.

In the meanwhile, Trevithick had been actively employed in preparing for his departure. He had constructed several new engines, and an apparatus for the Peruvian mint. He had also directed his attention to a point of the greatest importance in the then scarcity of quicksilver, the purification of silver ore by fusion, for which he constructed furnaces.

In October, 1817, Trevithick gave up all his property in England, and, leaving it to his wife and children, embarked for Peru.

At this time he had successively achieved the application of high-pressure steam, and had greatly increased the duty of the Cornish engine. The locomotive engine of his invention was then in practical operation, and had acquired the power of drawing 30 tons, at the rate of four miles an hour, and was found to be capable of surmounting rising gradients. Trevithick was in the zenith of his power, and all that he had promised, and which had been so long delayed by prejudice, was then accomplished; having, indeed, done more than any other man for extending the domain of steam.

In February, 1817, he arrived at Lima, where his presence excited the utmost enthusiasm. He was received with the greatest honours, while the official announcement of his arrival, in the Government Gazette, created the greatest expectations among the whole people. He immediately obtained an audience of the Viceroy, and the Lord Warden of the Mines was directed to escort him, with a guard of honour, to the seat of his future labours. The chief men of the mining district came many days' journey to Lima to see and welcome him, and all exerted themselves to show their esteem for the well-deserving Don Ricardo Trevithick. Never, perhaps, was European so well received in the New Indies. He was no Las Casas coming to rescue an injured population from oppression, he came as a benefactor in another way, as a man of science, to repair their old resources, and to open new mines of wealth. It was the first benefit they had received from the Old World, and no wonder that a warm-hearted people welcomed Trevithick with as much enthusiasm as Columbus had once awoke in Spain.

The exertions of Trevithick were crowned with success, and he was equally rewarded by their profitable return, and by the gratitude of the people. The produce of the mines grew in an unexpected degree, and the coining machinery was increased sixfold. His partners united in expressing their obligations to him, and the authorities showered down honours upon him. He is said to have been created a marquis and a grandee of Spain, and the Lord Warden of the Mines proposed to raise a statue of him in massy silver.*

* For the best account of the early part of Trevithick's American career, see a paper by Mr. Boase, in the first Volume of the Transactions of the Geological Society of Cornwall, p. 212.

The times, however, changed, political dissensions arose, and civil war broke out; Trevithick's fortunes changed to losses, and he determined to leave Peru; but this was no easy matter, for the veneration with which he was looked upon, as a benefactor sent from Heaven, made the people regard his absence as a public calamity, and take every measure to prevent his departure. At length he made his escape, through dangers which few less adventurous than himself could have encountered; and after escaping the terrors of the mountain and the desert, and the arm of the wandering savage, he again arrived safely in England, landing at Falmouth on the 9th October, 1827, bringing back, according to some accounts, a pair of silver spurs, as the sole remains of his once great wealth.

The great panic had then cast its gloom around, and Trevithick vainly endeavoured to raise capital to carry out some of his colossal projects. Those who knew his skill feared the waywardness of his character; and those who did not know his ability were repulsed by the giant nature of his enterprises. It was in vain he urged his own success, and represented the boundless resources of the Andean range. While in America, he had obtained grants of large tracts of land, and on one estate had a mountain of copper ore, which, like the hill mines of Potosi, or Montserrat, it would take hundreds of years to hew down. Here he proposed to construct railways, and, by the aid of capital and machinery, make the shores of the Pacific a grand commercial mart.

From this time little was heard of him, and a few years afterwards he died at Dartford, in Kent, on the 22nd April, 1833, leaving no other inheritance to his family but the grandeur of his name and the glory of his works.

Trevithick married a Miss Harvey, a lady of good connections; her brother subsequently acquiring a large fortune. An anecdote is related in connection with this lady, which proves Trevithick's love for her, and his spirit of perseverance even in trifles, for that during his long courtship, and notwithstanding the business in which he was engaged, he never missed walking every evening several miles to visit her.

He left by this lady two sons, Frederick and Richard, both members of the engineering profession, and holding high appointments as superintendents of locomotives. Thus they live by the fruits of their father's ingenuity.

Trevithick was of a robust and well-proportioned form, and had an expressive countenance. In his manners he was plain and blunt, but not rude; he maintained his opinions with honesty and firmness, and was only in fault that too frequent success made him adhere to them with pertinacity. He had, however, many disadvantages and many defects. The fertility of his invention led him to take more pleasure in imagination than in perseveringly carrying out his ideas to a practical result. Thus, even before his own departure for Peru, he had abandoned the locomotive to its fate, and left it to the kindred genius of George Stephenson for its accomplishment. The same is to be said of many other of his inventions, that he left to others to finish them, while some of his most promising designs went no further than the suggestion. Hence, many were inclined to look upon him as a mere schemer, and withdrew their countenance, particularly after they had suffered in his experimental enterprises.

In reviewing his career, and comparing it with that of his great rival, Watt, we are able to appreciate the fortune of the latter, in the steady friendship and co-partnership of Matthew Boulton, a resource which had Trevithick possessed, we do not know that he would have achieved greater results, but he would have enjoyed more reputation in his lifetime, and a better share of this world's goods, while his inventions would have been carried out by himself, and not by others.

Whatever may be the opinion as to his superiority over Watt, or his equality with him, this must be confessed, that next to Watt no other man has yet done so much for the steam-engine as Richard Trevithick.

LIFE OF GEORGE STEPHENSON, C.E.

BY HYDE CLARKE, ESQ.

George Stephenson was born in 1780, at a small and lone cottage between Close-House and Wylam, in Northumberland, and within nine miles of Newcastle, in the colliery district. He was one of several children, the son of poor people, who had long dwelt in the same neighbourhood, and who were very respectable. The elder Stephenson is said to have been a collier, but by other likelier accounts* an engine tenter at a colliery. That the parents were people of high character is best proved by the early life of the son, but most by his behaviour towards them.

Schooling they were ill able to give him, and it is not certain that he learned to read before he began to labour; but he had that best kind of teaching which comes from the heart. An open and upright mind was the true groundwork on which his greatness was built, and he owed it to the humble home in which he was brought up.

If not taught to write, George Stephenson was taught to be a good son, and an upright man; and thus in after-time to find in his own son a true helpmate, and one who fondly loved him. It is not likely that the lad felt any repining, but earnestly took up—what should be the lot in life of all—to work for his bread by the sweat of his brow. In common with his brothers, he was early set to work to earn his share of the household food—so early, that his first earnings were only twopence a day. He led the horse at the plough when almost too young to stride across the furrow; riding him to his work betimes in the morning, when many children were still asleep, and had not begun their boyish play.

So lowly were his first endeavours, that they were given to the ploughshare or the coal-heap. Sometimes he wrought at picking bats and dross from the coal; and he was so young, and so young-looking, that he had often to hide himself when the overseer went round, lest he should be thought too little to earn his small living.† From twopence a day he rose to fourpence, and at length to sixpence a day.

It is said that he early showed a mechanical turn, and that he mended the clocks and watches of the pitmen, and even their shoes and clothes‡, to eke out his boyish earnings; but it seems more likely that the watch and clock mending belonged to a later time of his life, for had he shown such a happy knowledge, it is hardly likely that his skill should have been so little thought of, as until his manhood it seems to have been.

Shortly after he had come into his teens he worked as breaksman for Waterrow pit, on the tramway between Wylam and Newburn. By this time his father had moved from Wylam to Walbottle. The lad now set up his first servant,

* Derby Reporter, Aug. 1848.
† Derbyshire Courier, Aug. 19, 1848.
‡ Leicestershire Mercury.

which was no other than a great dog, whom he taught to bring his dinner daily from Walbottle Colliery to the tramway.*

He is said even at this time to have helped in keeping his father and mother† —a homely deed, but one of which he had a greater right to be proud than of any engineering undertaking.

The Stephensons went to Willington and Killingworth, at which latter is a colliery belonging to Lord Ravensworth and his partners. Young George was now put to be stoker to a colliery engine, at one shilling a day, and as he himself told—"In my younger days I worked at an engine in a coal-pit. I had then to work early and late, often rising to my labour at one and two o'clock in the morning."‡ It was at Killingworth, however, that his lot in the world was settled, for there he made his beginning as an engineer.

As his strength grew so did his work, and he went on until he became an enginemen at 12*s.* a week. This was a great step, as he never forgot; for some months ago, being at Newcastle, he sent for an old fellow-workman to dine with him at the Queen's Head Hotel, and talk over old times—"Do you remember, George," asked his friend after dinner, "when you got your wages raised?" "Well," said Stephenson, "what about that?" "You came out of the office all smiles, and told us you'd got your wages raised to 12*s.* a week, and you were a man for life. Now, you would find it hard to tell what you have a week." "Yes," answered he, laughing, "I dare say I should."§

The next step that we know of in Stephenson's onward path was his getting seventeen shillings a week.‖ Whether this was at Willington or Killingworth is not settled; but soon afterwards he was at Killingworth, with a shilling a week more, and sometimes putting to his slender earnings a little for his over-time or for piece-work.

He had now grown up to manhood, and to a good name among his neighbours, being, as those who now live remember, a hardworking and upright man, having the trust of his masters and of his fellow-workmen.

One of the first deeds in which he is said to have shown his skill was at Killingworth. The sheaves over which the ropes work at the pit were much fretted as they were then made, and the ropes wore quickly away. Indeed, the ropes which elsewhere lasted three months, wore out at that pit in a month. This was a heavy outlay to the owners, and much trouble to the workpeople. Many ways were tried, but fruitlessly; and at length they gave up all hope of a cure. Seeing the evil was great, Stephenson gave his mind to find out whence it arose; and having done so, he set to work and put the sheaves to rights, so that a rope was saved in two or three months.¶

By this time he began to feel his own worth, and to yearn after something better than his then way of living; but he thought that to better his means, no other way was so good as to learn more, and fit himself for higher tasks. He had it in hand, moreover, to go to New England, whither the stream of settlers did not flow so fast as it does now, and where therefore greater hopes were held out to the skilful workman, who chose to leave the Old World so far behind. Nevertheless, it is not likely that it was his own thought, but that of one of the two men who were to be his fellows in the undertaking. One of these, named Wood, gave Stephenson a knowledge of writing and of numbers, which it therefore seems he did not learn until his manhood. It was the wish of Wood and Stephenson to try their hands in the New World at mechanics and farming, for which latter he had at all times a love.**

It was unwillingly, and with sorrow, Stephenson thought of leaving his kindred and his best beloved, his homestead and the land of his birth, of his

* Gateshead Observer, Aug. 19, 1848.
† Derbyshire Courier.
‡ Speech at Newcastle, June 18, 1844.
§ Gateshead Observer.
‖ Derbyshire Courier.
¶ Derby Reporter.—Derbyshire Courier.
** Derby Reporter.

boyish games and of his early manhood. It went against his heart; but he felt upon him the strong call to free himself from the thraldom which beset him round. Thus he told afterwards to one who knew him; he said, "You know the road from my house at Killingworth to such a spot. When I left home and came down that road I wept, for I knew not where my lot would be cast."* How bitter must have been the thought to one who felt so deeply!

It was not, however, to be so—we were not to lose him. While his lot hung by a thread, and day by day the time for leaving drew nearer, he had every morning as he went to his work to pass a newly-sunk pit at Killingworth, whence they were endeavouring to draw the water; and time after time did he see the pit overseers and engineers striving bootlessly to get through their work. In one of his walks he stopped to look, and could not help saying to some of those around, that if they would let him, he could, to use his own words, "set them to the bottom."† He was at first laughed at, and the engineer refused even to let him go down to look at the pit; but the overlooker said, "Well, Geordy, thee shalt see the pit," which he did, and showed them that for a hundred pounds it could be set to work, which was done. For this Stephenson was made an overlooker, with a horse to ride on.

When he was twenty-two years old he wedded a young woman of the neighbourhood; and in 1803 his son Robert was born; but he had no other child.

The engineman had now become a stripling engineer, and began to look out for a wider field. He seems to have tried his hand on most kinds of colliery work. It is said that he laid down some tramways, or waggon-ways, as they are named in the north, and made some improvements in them.‡

By Lord Ravensworth and others, Stephenson was employed in putting up steam-engines, and sloping planes under-ground; and in one pit, two or three engines were made to do the work of nearly 100 horses before used.§

Stephenson was now getting beyond his thirtieth year, his mind strengthened by knowledge, and by the trust that what he might do would reap its full reward. His child was growing up to boyhood, while his earnings were still so slender that he could do but little for his schooling. He had at this time felt bitterly his own want of learning, and he made up his mind that he would put his son to a good school, and give him good breeding. "I was, however," said he afterwards at a meeting in Newcastle,‖ "a poor man; and how do you think I did?—I betook myself to mending my neighbours' clocks and watches at night, after my day's work was done; and thus I got the means of bringing up my son." This he might well say with boasting, for it is one of the bright lights in his life.

It is said that on one occasion he had a watch given him to mend, of which the mainspring was broken. This he could not set right; so he went off to Newcastle, and asked a watchmaker to mend it. "Nay," says he, "take it to the botcher who spoiled it." So to another, and it was the same; but he went to a third, who, after making some strong remarks as to the watch being spoiled, mended it, Stephenson standing over him and learning.

The great draught of coal on the tramways, and the heavy trains which went forth from the pits, had set the minds of many at work to use steam instead of horses to draw the loads.

In 1782, or 1792, Murdoch made a model of a steam-carriage at Redruth. This was perhaps the beginning of Trevithick's, who is said to have been brought up under Murdoch, and who knew him well.

On March 24, 1802, Trevithick and Andrew Vivian took out a patent,¶ which

* Derby Reporter.
† Derbyshire Courier.—Derby Reporter.—Gateshead Observer.
‡ Gateshead Observer.
§ Derby Reporter.
‖ Newcastle and Darlington Opening.
¶ Repertory of Arts, 2nd ser., vol. iv. p. 241.

among other things was for the use of high-pressure steam for carriages, and by which the weight of the engine was brought very low. A carriage was made and run in Cornwall, and afterwards in London. Another was made in 1804 in South Wales, which was worked on the Merthyr Tydvil Railway, and "drew after it as many carriages as carried ten tons of bar iron, from a distance of nine miles, which it performed without any supply of water to that contained in the boiler at the time of setting out; travelling at the rate of five miles an hour."* The engine had an eight-inch cylinder, and the piston a four-feet six-inches stroke.†

These engines fell into dislike, from the one on the Merthyr Tydvil Railway blowing up,‡ having been made (against Trevithick's orders) without a safety-valve, and likewise from the wrong belief which got about, that the wheels had no bite on the rails, and could not work up a slope.§

One of Trevithick's engines was sent, singularly enough, to George Stephenson's birthplace, to Mr. Blackett, of Wylam; and thus it came within his sight. This happened most strangely, and most luckily, for the mind of Stephenson was now brought to bear on the great work of his life. The finding of Trevithick's model by Uvillé‖ was strange, and most fruitful in the deeds it brought about; but perhaps we owe more to the Wylam engine. On some ground or other the engine does not seem to have been put to work on the tramway, but was used to blow a cupola in an iron-foundry at Newcastle.¶ This engine had one cylinder only, and a fly-wheel to secure a rotary motion in the crank at the end of each stroke. If Mr. Blackett did not, however, work this engine, he had another of the same kind made and set upon his tramway at Wylam; and in 1813 it worked by the adhesion of its wheels on the rails, thus upsetting the belief that the engine could not so work.

At this time Mr. Blackett was fully at work experimenting on the Wylam railway with an ill-made engine of Trevithick's, which was found to be very troublesome, as the irregular action of the single cylinder made jerks in the machinery, so as to shake it in pieces. Still, the whole of the coals were taken down the tramway by this kind of engine.**

George Stephenson was likewise at work; and Lord Ravensworth and the Killingworth owners had such trust in him, that they gave him the money to make an engine, in the opening of 1814, and on the 25th or 27th July, 1814,†† it was tried on the tramway. As Stephenson said Lord Ravensworth and his partners were the first to intrust him with money to make a locomotive engine, "We called it *My Lord*. I said to my friends, there is no bound to the speed of such an engine, if the works can be made to stand it."‡‡

The engine had two cylinders, each eight inches diameter and two feet stroke; the boiler was cylindrical, eight feet long and thirty four inches diameter; the tube twenty inches diameter, passing through the boiler. The cylinders worked two pairs of wheels by cranks placed at right angles, so that when the one was in full operation, the other was at its dead points,—by which means the propelling power was always in action. The cranks were held in this position by an endless chain, which passed round two cogged wheels placed under the engine, and which were fixed on the same axles on which the wheels

* Wood on Railroads, 1st edition, p. 127.
† Stuart's Steam-engine, p. 460.
‡ Railway Register, vol. v. See likewise "Life of Trevithick."
§ Lardner on the Steam-engine, 1840, p. 336.
‖ Stuart's Anecdotes of the Steam-engine.—Civil Engineer's Journal, "Life of Trevithick."—Railway Register, vol. v. See likewise "Life of Trevithick."
¶ Wood on Railroads, 1st, 2nd, and 3rd edition,—2nd edition, p. 129.
** Ibid. p. 134.
†† Ibid. pp. 134 & 136, where different dates are given. In the report of Stephenson's speech at Newcastle, in 1844, he is made to say that the date was 32 years before, which would be in 1812. This is a mistake.
‡‡ Speech at the Newcastle and Darlington Opening.

were placed. The wheels in this case were fixed on the axles and turned with them.*

The trial was made on a piece of road laid with the edge-rail, rising about one in four hundred and forty, and was found to drag after it, besides its own weight, eight laden waggons, weighing altogether about thirty tons, at the rate of four miles; and after that time it kept steadily at work. The application of the two cylinders made the working of the engine regular, and secured the steady progressive motion which was wanted in the Wylam engine, there being only the single cylinder and fly-wheel.†

It was not till the next year that Stephenson took out a patent for his locomotive, and here we find the bad working of the patent laws as bearing upon our poor workmen. Had it not been that his first engine was not perfect, he could have had no patent, and would have reaped no fruit from his days and nights of toil, as he could not raise the money to pay the heavy fees which are drawn from the patentee. Even for his first trial he wanted money, for which he was beholden to the kindly feeling of Lord Ravensworth: much happier than Oliver Evans, who fruitlessly sought in America and England for the means wherewith to start his steam-waggon.

Fire-damp is one of the greatest evils happening to coal-mines, and one which is too well known to all having anything to do with them. Thirty or forty years ago this was so strongly felt that many mines had reached their furthest workings, because the men had no good means of going on, for the least flame was enough to set the fire-damp burning, and the steel-mill gave little light, and was unsafe.

In 1813 Dr. Clanny made a lamp, to which he gave air from the mine, through water, by bellows. This lamp went out of itself in explosive mixtures. It was to be worked by hand or by machinery, but was too heavy to be moved about readily.

From what Dr. Clanny had done, and from a fearful loss of life in the Felling Colliery, whereby 101 men, women, and children died, the minds of many were turned to some way of lessening the fearful evil of fire-damp. At Sunderland a meeting was held, wherein Mr. Buddle, Mr. Dunn, Mr. Cuthbert Ellison, M.P., Bishop Gray, Dr. Clanny, and others, had a share, and who called upon Sir Humphrey Davy to search into the whole matter.‡

Sir Humphrey looked at Dr. Clanny's lamp, but he was told it was too heavy and too costly to be useful. He tried phosphorus and the electrical light; but at length he found out that a lamp could be made air-tight, and to which the air could be sent in through very small pipes or tubes, or from small openings in wire gauze put below the flame, and having a chimney at top of the same kind, for carrying off the foul air. This he afterwards brought to bear in the shape now so well known as the Davy Lamp, or Davy, in which he was greatly helped by Dr. Faraday.

Meanwhile others were no less busy: Mr. R. W. Brandling, Dr. Murray, and Mr. John Murray, made lamps, and so did George Stephenson; and at length there was very great strife between the friends of Davy and Stephenson, as to who was the first. We have here a small book, written by or for George Stephenson, in his own behalf, and which is the only work of his which is printed, other than reports, for he never liked writing or reading.

Stephenson's book is called "A Description of the Safety Lamp, invented by George Stephenson, and now in use in Killingworth Colliery; to which is added, an account of the Lamp constructed by Sir Humphrey Davy, with Engravings. London: Baldwin, Cradock, and Joy; Archibald Constable and Co., Edinburgh;

* Lardner on the Steam-engine, p. 340.

† Wood on Railroads, 2nd edition, p. 136.

‡ See Sir Humphrey Davy's several works in 1815, 1816, 1818, and 1825, but which are nearly the same. The one here quoted is that of 1818.

and E. Charnley, Newcastle, 1817." It is only about sixteen sides, and was printed by S. Hodgson, of Newcastle, and has four engravings.

Another very interesting book is the "Report upon the Claims of Mr. George Stephenson relative to the Invention of the Safety Lamp. By the Committee appointed at a meeting holden in Newcastle on the 1st of November, 1817, with an appendix containing the evidence." This was printed at Newcastle, and has three plates, which are the same as in Stephenson's book.

Stephenson says, "Several of my friends having expressed a wish that I would lay an engraved plan of my Safety Lamp before the public, with as correct an account of the dates of the invention as I am able, I have resolved to do so. I was, at the same time, advised to publish the steps by which I was led to this discovery, and the theory I had formed in my own mind upon the subject, which, with the facts from which I drew my conclusions, were freely communicated to several persons during the time I was engaged in the pursuit. With this I cannot persuade myself to comply; my habits, as a practical mechanic, make me afraid of publishing theories; and I am by no means satisfied that my own reasons, or any of those I have seen published, why hydrogen gas will not explode through small apertures, are the true ones. It is sufficient, for our present purpose, that that fact has been discovered, and that it has been successfully applied in the construction of a lamp that may be carried with perfect safety into the most explosive atmosphere."

"During the four years," Stephenson goes on to say, "that I have been employed to superintend the engines at Killingworth Colliery, one of the most extensive mines in Northumberland, where there is a considerable quantity of machinery underground, I have had frequent opportunities of employing my leisure hours in making experiments upon hydrogen gas. The result of those experiments has been the discovery of the fact above stated, and the consequent formation of a Safety Lamp, which has been and is still used in that concern, and which my friends consider (with what justice the public must decide) as precisely the same in principle with that subsequently presented to their notice by Sir Humphrey Davy."

The first thought of the safety lamp had been long in Stephenson's mind; and in August, 1815,* he made a drawing of it, which was shown to several people on the works—among others, to Mr. Nicholas Wood,† whose name is now, for the first time, seen along with that of Stephenson. He was then a viewer at Killingworth, and seems to have taken a great share and delight in all that Stephenson did, as is shown by the works of both. Stephenson told Wood that he thought a lamp might be made which would burn the fire-damp without blowing up. The way was this—to make a tube in the bottom of the lamp, and he thought the draught of the flame upwards would be greater than the force downwards. Wood drew out the plan under Stephenson's eye, and in October, 1815, they went to Mr. Hogg, a tinman, at Newcastle, and had a lamp made, which a fortnight after was put into Stephenson's hands. When Stephenson first spoke about it, he asked that the tube might be made a quarter of an inch in bore, but Mr. Hogg having hinted that it probably would not burn, it was made half an inch bore, and a slide put to it so as to lessen it if need were.

This first lamp had an open top and conical shape, and was given to Stephenson on the 21st of October, 1815. This was on a Saturday, and in the dusk, Stephenson, Wood, and Mr. John Moodie, an under-viewer, went down to the A pit to try it. Stephenson lighted the lamp and went to a blower of fire-damp in the roof, going to it from the windward, and keeping the candle about twenty yards off. By some deals, they made a part of the mine foul, for the purpose of having a trial with the lamp.‡ About an hour afterwards Moodie went into the part so made foul, and found by the smell, &c. (of which, from knowledge, he was a sound judge) that the air was in such a state that, if a candle had been

* Stephenson, p. 7. † Report, p. 16. ‡ Report, Moodie's witness, p. 18.

taken in, the place would have caught fire, which would have been very fearful. Moodie told Stephenson it was foul, and hinted at the danger; nevertheless, Stephenson would try the lamp, trusting in its safety.

Stephenson took the lamp and went with it to the spot in which Moodie had been, and Nicholas Wood and Moodie, fearful, went further off. Stephenson tried the lamp, and it went out without making any explosion—on which, Stephenson again held forth the safety of his lamp.

"Stephenson," says Moodie, "again lighted the lamp, and Wood, who had now more trust in it, went with him to the former spot, and even held the lamp—they tried it again, and with the same end. When the lamp was put lighted in the gas, there was a great flame, the lamp was almost full of fire, and then it smothered out. Stephenson then said that he could so shift it that he could make it burn better."

This first lamp was made with a slide, to regulate the opening of the pipe through which air was sent into the lamp. The slide was partly shut before the lamp was brought near the blast of the blower—indeed, it was so far shut, that the lamp burned but weakly in good air; and when the lamp was brought to the blower the flame grew bigger, as already said, and then went out.* An explosion, indeed, took place within, but it did not pass outwards. The slide was several times shifted, and trials made afterwards with bladders filled with air from the blowers. The first trial was with the pipe quite open, and the explosion passed downwards. Trials were thereafter made with the slide so shifted, that at length the opening was so small, the explosion no longer passed downwards, and the lamp kept alight; but it was so weak, that it easily went out by being moved. It was therefore thought, that by making more pipes of this smallness, air enough for burning and for keeping up the light might be let in; and yet the holes or openings be so small, as still to stop the explosion from going downwards.† This was done.

Up to this time, Stephenson knew nothing of what Sir Humphrey Davy had found out or done, or of what he had written to the coal trade thereon. He now made his third lamp, which had more pipes, so as to get a better draught of air. He afterwards thought,‡ that if he cut off the middle of the pipes, or made holes in metal plates, set some way from each other, as far as the pipes were, that the air would get in better, and that there would be the same safety against explosion. Another lamp was therefore made and tried.

This third lamp did so well, that it was long used in Killingworth pits, and workmen were bound to it under a fine of half-a-crown for using a candle. This lamp was tried alongside with Davy's, and found to do as well.

In 1816 those who had called in Sir Humphrey Davy, thought it time to give him some reward, and therefore called a meeting of coalowners, at Newcastle, on the 31st of October, when Mr. Nathaniel Clayton took the chair. The meeting was to reward Sir Humphrey Davy, "for the Invention of the Safety Lamp."§ By this time a paper war had arisen, and while Bishop Gray and Mr. Buddle felt called upon to stand by Sir Humphrey Davy, a great number held to George Stephenson, and much bitterness of feeling was shown. Neither were there wanting those who upheld Dr. Clanny, Dr. Murray, of Edinburgh, Mr. John Murray, of Hull, and Mr. Robert William Brandling. Dr. Clanny was the first—Sir Humphrey Davy and Stephenson acknowledged this; but the lamps of the two latter had been brought into work, and the struggle lay between them. Dr. Clanny helped Sir Humphrey Davy, and Mr. Brandling‖ sided with Stephenson.

* Stephenson, in the Report, p. 15.

† Wood's witness, in the Report, p. 17.

‡ Report, p. 16.

§ The whole of this is well given in the Gateshead Observer of Aug. 19, 1848, from which the above is taken.

‖ Davy on the Safety Lamp.

Davy was so much the stronger than Stephenson, that he was better known, and had all the men of learning on his side, while Stephenson was backed by the Killingworth men, and all those who thought highly of what the self-taught workman had done with the locomotive and the safety lamp. Sir Humphrey's friends were angry that one so lowly should be set up against him—Stephenson's, that one so lowly should be put down, and kept out of his fair share of the work, to bolster up a great name. Both sides went great lengths, both went too far, and now it is easy to do right by all.

Perhaps Watt took a part, for he was an early patron of Davy, who was employed in the Pneumatic Institution, at Bristol, under Dr. Beddoes, in which Watt took a great share.

So much was said and done by George Stephenson's friends, they fought so hard for him, and against Davy, that the meeting on the 31st of August was held over till the 11th of October, when John George Lambton, the late Earl of Durham, took the chair. Mr. Brandling then moved that the meeting should be again put off, that inquiry might be made whether "the merit of the invention of the Safety Lamp was due to Sir Humphrey Davy, or George Stephenson." Mr. Arthur Mowbray likewise stood up for this, but it was set aside by a great number of hands. A purse of one hundred guineas was, however, given to Stephenson.

Stephenson's friends were very wroth at being thus beaten, and Stephenson himself thought that the meeting had dealt very unfairly with him in awarding the meed to Davy. "Whether or not," says Stephenson, in a letter afterwards printed, "Mr. Brandling is justified in the opinion he has expressed [that Stephenson was the inventor], it appears to me may be easily decided; and I shall only add, that if it can be proved that I took advantage, in the formation of the safety lamp, of any suggestions, except the printed opinions of scientific men, I deserve to lose the confidence of my honourable employers, and the good opinion of my fellow-men, which I feel an honest pride in, and which even in my humble situation in life is of more value in my estimation than any reward that generous, but indiscriminating affluence can bestow."

If Davy's friends spared nothing for him, Stephenson's were as steadfast; the war went on, and the Newcastle papers were full of writings, for and against. The Rev. John Hodgson, Mr. Buddle, Mr. Brandling, and the full number of "Friends to Justice," strove together; but neither side would give in, or own that it was in aught wrong: they were too busy in saddling things on each other to take off one bit from themselves. If Davy had the meeting of coalowners on his side, Stephenson was not to be left barren, and his friends therefore made up their minds that he should have a meeting of his own, and that plate should be given to him as a set-off against what had been done for Sir Humphrey Davy.

It should, however, be said that, having been beaten in getting an inquiry from the meeting of coalowners, they had a meeting of their own, to look into what Stephenson had done, and which ended in the Report, which has been already named. Stephenson, Nicholas Wood, and others who had a hand in the business, were called together, and gave witness as to what they had seen or done. This was written down and printed at the end of the Report, and it showed the faith the meeting had in the goodness and rightfulness of the side they had taken up. The members were, the Earl of Strathmore, C. J. Brandling, Esq., C. W. Bigg, Esq., Matthew Bell, Esq., R. W. Grey, Esq., Arthur Mowbray, Esq., James Losh, Esq.,* T. H. Bigg, Esq., Dr. Headlam,† C. N. Wawn, Esq., Anthony Clapham, Esq., and G. Charnley, Esq. Richard Lambert, Esq., was the Treasurer, and Robert William Brandling, Esq., the Secretary.‡

On the 1st of November, 1817, the further step was taken, and a meeting was

* Then partners with Stephenson in the patent for the rails and chairs.
† Afterwards a director of the Newcastle and Carlisle Railway.
‡ Mr. Brandling has not lived long after Stephenson.

held in the Assembly-rooms, Newcastle, at which C. J. Brandling, Esq., took the chair, "for the purpose of remunerating Mr. George Stephenson, for the valuable service he had rendered to mankind by the invention of his Safety Lamp." The first resolution held forth, "that Mr. George Stephenson, having discovered the fact that explosion of hydrogen gas would not pass through tubes and apertures of small dimensions, and having been the first to apply that principle in the construction of a Safety Lamp, was entitled to a public reward." A committee, headed by the Earl of Strathmore, was named to carry this out.

Davy's friends were anew stirred up, and they sent to the newspapers a writing, signed by Sir Joseph Banks, President of the Royal Society, William Thomas Brande, Charles Hatchett, H. W. Wollaston, and Thomas Young, giving their conviction "that Mr. Stephenson was not the author of the discovery of the fact in question, and was not the first to apply that principle in the construction of the Safety Lamp."

The other committee printed their report in answer, setting forth the whole truth, and ended by saying, "After a careful inquiry into the merits of the case, conducted, as they trusted, in a spirit of fairness and moderation, they could perceive no satisfactory reason for changing their opinion." The dead set made by the men of learning who stood by their friend Davy, did not frighten the others, and did not put a stop to their work. Their minds were made up, and the subscriptions set afoot by them went on steadily. Lord Ravensworth (then Sir Thomas Henry Liddell, Bart.) and partners gave one hundred guineas; C. J. Brandling and partners gave the like; Matthew Bell and partners gave fifty guineas; and John Brandling and partners gave the like. Thus, a goodly purse was filled; and the great gifts of the Liddells, and the other coalowners, are a very good earnest of how Stephenson was looked upon in his own neighbourhood, and the path which lay open before him. It was not hard to tell what with his inborn skill he would do.

In January, 1818, a dinner was given to George Stephenson, at the Assembly-rooms, Newcastle, when a silver tankard was put into his hands, together with one thousand guineas.

"I shall ever reflect with pride and gratitude," said he, "that my labours have been honoured with the approbation of such a distinguished meeting; and you may rest assured that my time, and any talent I may possess, shall hereafter be employed in such a manner as not to give you, gentlemen, any cause to regret the countenance and support you have so generously afforded me."

This pledge, as is well known, Stephenson fulfilled.

In 1813, when he was thirty-three, Stephenson had been set, as we have seen, to overlook the engines at Killingworth, in which higher berth he brought out his locomotive engine and his safety lamp; so that Killingworth had its own works, as well as Wylam or any other colliery. His son was being brought up at Newcastle, and afterwards he sent him to Edinburgh, that he might be at its University—then at its height, and one of the greatest schools of its day.

In 1814 Stephenson brought out his first locomotive, and in 1815 he was busy with the safety lamp and the second locomotive. He had likewise some work in laying down slopes and railways.

He had not been able, as we have seen, to take out a patent when he made his first engine, but he soon after became known to Ralph Dodd, the ingenious engineer and architect, and with him took out a patent on the 28th of February, 1815, for a method of communicating power to the engine without the cog-wheels used in the first engine.* It was Wm. Henry James who brought Stephenson and Dodd together, for which he had part of the patent.

This engine was put to work on the Killingworth Railway.

In 1816 Trevithick left England for the West Indies, leaving the locomotive

* Lardner on the Steam-engine.—Ritchie on Railways, p. 222.—Stuart's Anecdotes of the Steam-engine.

to look after itself, for what he knew. Stephenson, however, looked after it. In this year he took out a patent with Mr. William Losh, a great engineer of Walls-end and Newcastle. Among other improvements was that of "sustaining the weight, or a proportion of the weight, of the engine upon pistons, moveable within the cylinders, into which the steam or water of the boiler is allowed to enter, in order to press upon such pistons, and which pistons are, by the intervention of certain levers and connecting-rods, or by any other effective contrivance, made to bear upon the axles of the wheels of the carriage upon which the engine rests."

Messrs. Stephenson and Losh had their patent likewise for a cast-iron rail, which was held to be an improvement on the rails then used.* As railways were then laid, the waggon-wheels met with a hindrance at the joints, and a shock was given, and the rails put out and broken. Stephenson therefore wished to fix the rails fast in the chairs. His rails were made with a half-lap joint, having a pin or bolt, which fixed them, so that the end of one rail should not rise above the end of the next one, and so that the rails should not yield if the block sank.

We have seen that in 1817 Stephenson was busy in his struggle with Davy about the safety lamp. In the next year, the dinner was given to him, and he was laying down railway works and making engines. In that year (1818) and the next he gave his time, as Nicholas Wood acknowledges,† to experiments with Wood on railways, which have been printed. His son had now become an under-viewer, and was a helper to his father. Perhaps about this time Stephenson first came up to London for the patents.

Stephenson was about forty when he was first called on to be engineer to the Stockton and Darlington Railway. This could hardly be named as more than a tramway; and, although travellers were carried by coach, it was only a coal line, made to draw the coals from the pits in South Durham.

The main line was only twenty-two miles long, and was to ship coals from the dale of the Tees, between Darlington and Stockton. The money to be raised was only about a hundred thousand pounds, and the Act was got in 1821. The works were most likely begun in the next year. The first line was from Witton-park colliery, to Stockton-on-Tees, and the money to be raised by shares was 82,000*l.*, and by loan 20,000*l.*

In 1823 and 1824, further acts of parliament were got; and the Company were allowed to run locomotives and carry passengers. On the 17th of September, 1825, the line was opened.‡ Stephenson now tried on a large scale, on the Hagger Leases branch of the Stockton and Darlington Railway, his locomotives, which were thought to be very successful.

Part of the rails were laid down on square blocks of wood, § and part on stone blocks. Nicholas Wood‖ wrote recommending the latter. Stephenson, perhaps, wished to get a smoother road for the sake of his engines, which had been one of his ends in his patent with Losh. The old way of setting the blocks was by mallets and shovels, beating the blocks till they came to the right level; but Stephenson set up another way, which is that now followed. He had a portable lever, about twenty feet long, which lifted up the block by the short end, about a foot high; and by letting it fall several times upon the coating of the road in the intended seat, throwing at the same time gravel or fine sand under it, made a solid bed for it. It is then set to its right level, both lengthwise and crosswise, by squares and sights.¶

While the works were going on, Stephenson was beset in the "Newcastle

* Ritchie on Railways, pp. 31-37. † Wood on Railways.
‡ Ritchie on Railways, p. 283. § Ibid. p. 57. ‖ Wood on Railways, 1st ed.
¶ Ritchie on Railways, p. 60.—This way was first brought in by George Stephenson, but it is not sure whether on the Stockton and Darlington Railway, or afterwards.

Magazine,"* by Mr. B. Thompson, of Ayton Banks, who wished to show that locomotive engines would never pay, and that Stephenson had reckoned wrongly. Thompson said that locomotives were not equal to horses. He further said, that the breaking of rails at Killingworth was very great, and that horses were used to help the engines on. If steam were to be used, he thought stationary engines better than locomotives. This had great weight when the same question was discussed about the Liverpool and Manchester Railway.

Mr. B. Thompson was the maker of a new kind of rail,† which was tried on the Brunton and Shields Railway, but was not found to answer. It was something like Stephenson's, but the rail was fastened to the chair by a screw bolt.

Nicholas Wood took the side of Stephenson,—said that Thompson's tale about the rail and horses was untrue, and gave other reckonings to show that Thompson had made the cost of the locomotives too much.

Stephenson may be looked upon as one of the makers of Nicholas Wood's book on railways, for he made all that belongs to locomotive-engines, and on the Stockton and Darlington Railway he had set forth the best way of making railways. This is the first great book on railways, and which set Tredgold writing. Wood gives a report by Stephenson, and acknowledges his help in the experiments to discover the precise amount of resistance opposed to the motion of carriages on railways, and the resistance to different forms of carriages.‡ These, undertaken seven years before, show how careful Wood had been in getting his book up. The book is worth the more, from George Stephenson's share in it.

Wood must have been of great help to Stephenson many other times besides this; and his reading and mathematical knowledge must have stood Stephenson in good stead. It is said § that the Rev. William Turner, of Newcastle, was a great helper of Stephenson with books, with instruments, and advice.

Before 1825 Stephenson laid down the Stockton and Darlington, Hetton and Springwell Railways, and set the locomotive at work on them. He had now two learners under him, his son Robert, born in 1803, and brought up at Newcastle and Edinburgh; and Joseph Locke, born in 1805, at Attercliffe, near Sheffield, and brought up at Barnsley Grammar School. The latter laid out the Springwell tramway, from Springwell to Jarrow,‖ which is said to be a good work.

Both Robert Stephenson and Locke are now members of the House of Commons; the former a Knight of Leopold, and the latter of the Legion of Honour. These were the first offspring of what has since been found a great school of engineering. By George Stephenson were made the railways of the north-east, by Robert Stephenson those of the south-east, and by Locke those of the west, from Southampton to Glasgow, leaving only one great share for Brunel. Therefore, to the three first named do we owe most of our railways. At Birmingham their works meet; and here, some day, will be a fitting seat for some remembrance of the three.

In 1824 there were two great things in George Stephenson's life—the setting up of the Locomotive Factory, and his being named as engineer of the Liverpool and Manchester Railway.

It has been already seen how he became known to the Messrs. Pease, of Darlington; and they set up the factory at Newcastle, for the building of locomotive engines, of which there was now some want. Mr. Michael Longridge had a share in the new factory, and afterwards Robert Stephenson.¶ It was first known as the factory of George Stephenson and Co., and afterwards of Robert Stephenson and Co. It still flourishes, under the care of Mr. Hutchinson.

The first locomotive used on the Stockton and Darlington Railway was built

* Newcastle Magazine, vol. 1.
† Ritchie on Railways, p. 32, where there is a drawing.
‡ Wood on Railroads, 1st edition, p. 175.
§ Gateshead Observer. ‖ Ibid. Aug. 19, 1848. ¶ Ibid. Aug. 19, 1848.

by George Stephenson, and, we believe, at the Newcastle factory. This was the first locomotive used for drawing passengers on a railway, which it did in 1825, and is said to be still in being. In 1846 it was decked out, and brought forth to head the train at the opening of the Middlesborough and Redcar Railway, so that it has had a busy life for a locomotive. It is a shame to us that there is no English museum for such things, or it might be as proudly kept as we are told that of Cugnot is, in the *Conservatoire des Arts et Métiers*, at Paris.

The Rocket, the winner of the 500*l.* on the Liverpool and Manchester, was built at Newcastle, and gave a great name to the factory, so that orders poured in from abroad.

We now come to the really great railway work of Stephenson—the Liverpool and Manchester Railway.*

In 1822, Wm. Henry James, one of the great projectors of his day, was introduced to Mr. Joseph Sandars, of Liverpool, an eminent merchant, and a man of great energy and intelligence. James proposed to Mr. Sandars the scheme of a Liverpool and Manchester Railway: and Mr. Sandars, seeing its advantages, at once agreed to pay 300*l.* for a preliminary survey, which, after some delay, was made by James.

A prospectus was published in October, 1824, and through the influence and exertions of Mr. Sandars, a company was established. It was natural that, in seeking for a practical railway engineer, James should introduce George Stephenson, with whom he was already connected, who was the inventor of a successful locomotive engine, and who was then engaged in constructing a great line for that day—the Stockton and Darlington Railway.

The Messrs. Rennie were chosen as the consulting engineers, and George Stephenson was the practical engineer. After an unsuccessful attempt in Parliament, the Act was obtained in 1826, and the works begun under the care of George Stephenson only. The length of the line is 33 miles, and it includes three tunnels of a whole length of 4,751 yards, one viaduct, sixteen embankments of a length of 8 miles 815 yards, thirteen cuttings of a length of 13 miles 375 yards; and passes over 34 bridges, and under 41.†

The chief difficulty was the passage of Chat Moss, in which Stephenson fully succeeded, against the expectations of the public. Indeed, the engineering works of the Liverpool and Manchester Railway are still among first-class works, notwithstanding the many great undertakings which have since been brought forward.‡

While the works were going on, a great contest divided the Liverpool and Manchester Board, and on which the fate of railways really depended. This was whether fixed engines or locomotives should be used to work the traffic. The leaven of Mr. B. Thompson's advocacy of fixed engines was still busy, and a great part of the Board held firm to this plan. Mr. Sandars saw that the success of the company depended on the adoption of the locomotive, and spared no exertion to effect it. It had been already left to him to determine whether Stephenson or Mr. Rastrick should be managing engineer, and he had decided in favour of the former. He had been greatly influenced by the talent, intelligence, and integrity of Stephenson, and he entered warmly into his views for developing the powers of the locomotive.

The Board chose Mr. James Walker and Mr. Rastrick, who were then considered competent railway engineers, to report on the propriety of adopting fixed engines or locomotives; and so little were they acquainted with the capacity of the locomotive, and so little was their foresight, that they favoured the fixed engine in their reports.

* The authorities for this are, the pamphlet on the Liverpool and Manchester Railway, by Joseph Sandars, Esq., and "An Account of the Liverpool and Manchester Railway," by Henry Booth, Esq.

† Tuck's Railway Shareholders' Manual. ‡ Whishaw on Railways.

Mr. Sandars, at his own expense, had before this time despatched to Newcastle Mr. Sylvester, a very able man, to examine into the workings of the locomotive; and on which he gave a report strongly in favour, and opposed to the views of Messrs. Walker and Rastrick.

A deputation of Mr. Sanders and other directors, accompanied by Mr. Henry Booth, the secretary, was appointed in 1824 to make an investigation in the colliery districts, and their report recommended the locomotive for adoption. In 1828 another deputation went.

Stephenson answered in the same terms, and directed his son Robert, and his assistant Joseph Locke, to reply to the report of Messrs. Walker and Rastrick. In the eyes of clear-sighted men, they were held to have done this fully.

The Board determined on offering a premium of 500*l.* for the best locomotive, to be tried on the Liverpool and Manchester Railway in the end of the year.

Mr. Booth suggested to Stephenson the adoption of tubes to be put in the boiler, and through which the fire was to pass. It had been before suggested to pass the water through tubes, but this had not been found to answer. Mr. Booth's suggestion, and that of sending the steam into the chimney to create a vacuum and a draught, gave a power to the locomotive which enabled it to gain the prize, and laid the foundation of the mighty speed it now has.

In October, 1829, the engines were tried, and Stephenson's "Rocket" carried the day over Messrs. Braithwaite and Ericson's, Mr. Burstall's, and Mr. Hackworth's engines.

From this time the success of the locomotive was undoubted, and on the opening of the line in July, 1830, the predictions of Stephenson and his friends received their accomplishment in the attainment of a high degree of power and unexampled speed.

George Stephenson now became the engineer to many railway undertakings, among which were the York and North Midland, Lancashire and Yorkshire, North Midland, Birmingham and Derby, Chester and Crewe, Chester and Birkenhead, Maryport and Carlisle, and Whitby and Pickering, which he constructed. He was also engaged on the Manchester South Union Railway, a South-Western or Exeter Railway, the West Cumberland or Morecombe Bay Railway,* and many projected railways. About 1838 he began to give up business to his son; and the only works he had in hands of late years were the Whitehaven Railway, and the Manchester, Buxton, and Mattock Railway.

Having in the progress of the York and North Midland Railway become acquainted with Mr. Hudson, Stephenson turned his attention to the means of investing his capital, and became a large proprietor of collieries with Mr. Hudson and others, at Clay Cross, in Derbyshire, and in Leicestershire. He likewise opened limeworks, and became a director of the Leicester and Swannington Railway. By these operations he gave a great impulse to the midland coal trade.

From about the year 1840 he settled at Tapton House, in Derbyshire, and retired from professional pursuits, so far as his active disposition would allow him. He received from the King of the Belgians the Order of Leopold, and was honoured by the respect of many distinguished individuals. His greatest enjoyment was, however, the success of his only child, Robert Stephenson, and the promise he has given of equalling his father's achievements.

On the 12th of August, 1848, George Stephenson died at Tapton House, aged 68, still in full vigour of mind and body, but stricken down by a short illness, said to have arisen from some experiments in his hothouses. He was buried in Chesterfield church.

* Surveyed and projected in 1836, by the author of this Memoir.

BERZELIUS.

Berzelius was born on the 20th August, 1779, in Ostergöthland, in Sweden, of a respectable family. At the age of 17 he entered the University of Upsala, where he made a rapid progress in his studies, particularly his favourite science —chemistry. After passing the necessary examinations, he received his diploma of doctor in medicine, in 1804, and was appointed medicinæ et pharmaciæ adjunctus at the Collegium Medicum at Stockholm, and gave instruction in chemistry to young students; and, on account of his small income, was obliged to practice occasionally as a physician. In 1807 he was appointed medicinæ et pharmaciæ professor, and in the same year he instituted, in conjunction with seven other eminent men, the Swedish Medical Society at Stockholm, now a most flourishing institution, and constituting the very heart of the medical profession in Sweden. In 1808 he was made a member of the Royal Academy of Science, in 1810 officiated as president, and in 1818 as perpetual secretary. On the occasion of holding this appointment for a quarter of a century, a dinner was given in the academy by the members to this distinguished *savant*, which was presided over by the present King of Sweden, then the crown prince, who, on proposing the health of Berzelius, expressed his grateful acknowledgment of his own obligations to the great chemist, for the valuable private instruction he had received from him in his younger days. In the same year he was appointed a member of the Royal Sanitary Board, of which, at the time of his death, he was the senior member. As a proof of the magnitude of his laborious pursuits, it may be sufficient to mention that he first developed the electro-chemical system, and that he has also examined and minutely described the atomic theory of the elementary bodies. He discovered and examined several great classes of chemical combinations; as, for instance, the different degrees in which sulphur combines with fluoric acid, with platinum, columbium, vanadium, tellurium, and phosphorus, the sulphates, &c. In organic chemistry he has no less distinguished himself by his experiments; and, properly speaking, he has laid the foundation of vegetable and animal chemistry, more particularly the latter. As regards chemical analysis, the highest merits are due to him, for having arranged a new and generally adopted chemical nomenclature. In 1818, Berzelius discovered a new metal—selenium; it is very rare, being found only in some iron pyrites, and a few ores of silver, copper, and some other metals. In 1824, he discovered the metalloid, silicum, to be the base of flint, or silex, and, next to oxygen, the most abundant element in nature. It is found in quartz, opal, chalcedony, flint, jasper, garnet, topaz, hyacinth, beryl, emerald, augite, felspar, hornblende, mica, steatite, chlorite, sparingly in vegetables, in most rocks and earths, sand, some iron ores, hot springs—as the Geysers, in Iceland, &c. In the same year he also discovered zirconium, in hyacinth, jargon, and endvalite; and in a very rare mineral, called thorite, he also found, in the year 1829, a new metalloid, which he named thorium. The use of the blow-pipe, though partially developed, was never practically brought into operation until the subject of this memoir applied it to its present useful purposes; and his work on it has raised him a lasting monument in the annals of mineralogy. In 1835, on his wedding-day, the king sent him a patent of nobility, creating him a baron of the kingdom. His works, which have been for the most part translated into English, French, German, Italian, Spanish, and Polish, are so numerous and voluminous, that, considering the accuracy with which everything is described, it appears to be almost a

wonder how one man, whose time, besides, is occupied by a great amount of official duties, has been able to accomplish such a mass of scientific publications. Berzelius had received from his Majesty King Charles John, many marks of high distinction; he was created a nobleman in 1818, a Baron in 1835, Knight Commander of the Royal Order of Wasa in 1821, and Grand Cross of the same order in 1829; he was Knight of the Royal Swedish Order of the Polar Star and of several foreign orders received from the Emperor of Russia, and the Kings of Prussia, Denmark, Belgium, France, and Sardinia; an honorary member of upwards of 100 literary and scientific societies. In consideration of the great and manifold services which Berzelius has bestowed on his native country, the members of the Diet at Stockholm, in 1840, voted to him the annual sum of 2,000 dollars banco, as a pension for his lifetime, independent of his former emoluments.

RULES AND REGULATIONS

FOR WORKING THE GALES, PITS, LEVELS, AND WORKS, IN THE FOREST OF DEAN, GRANTED IN PURSUANCE OF THE POWERS CONTAINED IN THE ACT 1 & 2 VICT. C. 43.

We have been induced to give the subjoined rules at length, as emanating from the Crown under the advice and counsel of parties competent to frame such a code, that others may, so far as circumstances admit, be enabled to adopt or alter them.

Coal Mines.

No. 1. All persons now or at any time hereafter holding one or more gale or gales of any mine or mines of coal granted by the gaveller or deputy-gaveller in conformity with the provisions of the aforesaid Act, mentioned in the said Award, shall be entitled to the free and unrestricted use and enjoyment of all levels, drifts, drains, cuts out, and watercourses, pits, shafts, and pit-heaps, belonging or appertaining to the gale or gales so holden, with liberty to dig, sink, work, and drive, make and use such levels, drifts, drains, cuts out, watercourses, pits, shafts, and pit-heaps, with sufficient heap room for the purpose of winning and working, selling or disposing of, the produce of such mines so galed, nevertheless, so that the above privileges be exercised subject to and in conformity with the provisions of the said Act and with these regulations.

No. 2. No persons shall be entitled to any other vein or veins of coal than that or those awarded by the Mining Commissioners, or galed by the gaveller or deputy-gaveller, and any under-

lying or other veins not so awarded or galed may be galed to other parties, but to be so worked as not to impede or injure the workings of the tracts already allotted, or hereafter to be allotted or galed.

No. 3. All persons now or at any time hereafter holding one or more gale or gales of any mine or mines of coal within the said hundred, either by virtue of the foregoing Award, or by grant from the gaveller or deputy-gaveller, shall also be entitled to make and form, and to have the free and unrestricted use and enjoyment of all such railroads and other roads as shall be deemed requisite by the gaveller or deputy-gaveller for the proper carrying on of the work or works, opened or to be opened under or by virtue of such gale or gales, subject, nevertheless, to the previous approbation and allowance of the Commissioners for the time being of Her Majesty's woods, forests, land revenues, works, and buildings, signified by some writing under their hands, and subject also to the use by the owners of other works of the said railroads and other roads upon payment of reasonable compensation for the use thereof; the amount of compensation, in case the parties shall differ about the same, to be settled by reference to two disinterested persons, one to be chosen by each party, in the usual way, or by their umpire.

No. 4. All persons now or at any time hereafter holding any unopened gale or gales of coal, either by virtue of the foregoing Award, or by grant from the gaveller or deputy-gaveller, shall *bonâ fide* commence opening the same within the space of 5 years from the date of the said Award as regards gales, thereby ascertained, and as regards all other gales within 5 years from the date of the grant thereof respectively; provided, nevertheless, in the event of any unavoidable and unforeseen mining accident or impediment occurring, or other reasonable cause of delay being proved to the satisfaction of the gaveller, to prevent the opening of such works within the said period of 5 years, then the time may be extended at the discretion of the gaveller by some writing under his hand according to circumstances.

No. 5. No tonnage or other rent to be paid during the first 2 years of the holding for works now being opened, or hereafter to be opened, unless any coals shall be wrought in the meantime, in which case the stipulated tonnage shall be paid thereon to Her Majesty, her heirs and successors.

No. 6. All persons now or at any time hereafter holding one or more gale or gales of any mine or mines of coal shall be at liberty to give up all or any of such gales, as regards the said gales ascertained by the foregoing Award, at the end of the first 2 years from the date thereof; and as regards gales hereafter to be granted, at the end of 2 years from the date of the grant of such gales, upon giving 3 months' previous notice; or at the end of any subsequent year on giving six months' previous notice,

such notices respectively to be in writing, and to be left at the office of the gaveller or deputy-gaveller.

No. 7. No steam or fire-engine shall be erected within any enclosure, or within 60 yards of the fence of any enclosure, without the previous approbation and allowance of the Commissioners for the time being of Her Majesty's woods, forests, land revenues, works, and buildings, first had and obtained, and signified by some writing under their hands.

No. 8. All persons now or at any time hereafter holding one or more gale or gales of any mine or mines of coal, shall be allowed six months from the time of giving up as aforesaid to remove and carry away such quantity of coals as may then be lying upon bank at the several pits or levels of the gale, and also for removing the machinery, erections, or buildings, provided that in removing such resting coals, machinery, erections, or buildings, no wilful or unnecessary impediment or hinderance to Her Majesty, her heirs or successors, or to the entering galee, shall be given; but in the event of any gale which is drained by a steam-engine or other machinery, and lying on the land side of any other gale worked also by steam-engine, being worked out or abandoned before such gale lying to the deep thereof, the galee of such worked-out or abandoned gale shall leave at the office of the gaveller or deputy-gaveller, and also at the usual or last known place of residence of the person or persons holding such gale lying to the deep of the worked-out or abandoned gale, notices in writing of his intention to discontinue the workings of his engine 3 months at least previous to such discontinuance.

No. 9. All persons now or at any time hereafter holding any mine or mines of coal by virtue of a gale or gales shall work and carry on the same in a fair, orderly, and workmanlike manner, and according to the best and most improved system for the time being of working coal mines, and shall not desist from working the same for a space exceeding 5 years at any one time after the vein of coal has been gained.

No. 10. In proceeding to open new works, the situation and extent of the ground which is to be occupied by each pit or level mound shall be determined by the gaveller or deputy-gaveller, and a memorandum of such situation and extent shall be entered by the deputy-gaveller in a book to be kept for that purpose, to be called "The Surface Boundary Book;" and such situation and extent shall also be marked or delineated on the copy of the engraved plans to be kept in the deputy-gaveller's office, and if during the progress of any works any ground shall be applied for in manner provided by the 25th clause of the said Act recited in the said Award, then, as regards any lease which shall be obtained in pursuance of such application, a memorandum or docket of the grant thereof shall be entered by the deputy-gaveller

in the Surface Boundary Book, and delineated on the plan as above-mentioned.

No. 11. Any Free Miner desirous of taking a gale shall apply in writing to the gaveller or deputy-gaveller, in manner directed by the said Act, describing the situation of such proposed gale and the names of the vein or veins of coal proposed to be worked; and in setting out metes and bounds to every such proposed or new gale, the gaveller or deputy-gaveller shall have regard to the probable cost of winning the coal in the spot galed, and the estimated quantity of coal to be obtained by such winning.

No. 12. Every gale hereafter to be granted shall be granted on condition that when any level, pit, or other work hereafter to be opened by virtue of a gale, is abandoned or disused, the galee shall remove all buildings or works which shall no longer be necessary for carrying on such pit, level, or work, and shall smooth the surface of the ground which has been occupied by the same; and the galee shall set up at his own costs, upon or about any such abandoned or disused work, such walls, fences, or other protection, as the gaveller or deputy-gaveller may deem necessary for the safety of cattle; and in case of the galees refusing or neglecting so to do within 3 months after notice given to or left for him at his last known place of abode by the gaveller or deputy-gaveller, then the galee shall pay the expense of making such walls, fences, or other protection and removal.

No. 13. That as to all gales hereafter to be granted, the same shall only be granted upon condition that the galee work and get in each and every year a certain quantity of coals, so that the rent, tonnage duty, or royalty, payable and to be paid to Her Majesty, her heirs and successors, shall not be less in any year in respect of coals got than a certain sum, to be expressed in and by the grant of every future gale; and such minimum quantity of coals shall be ascertained and determined by the gaveller or deputy-gaveller, or by arbitration, as is provided or referred to in the 56th section of the printed copy of the said Act; and further, upon condition that the galee do, in the event of there not being sufficient coal got to make up the certain sum by way of rent, to be so expressed, pay and make up such certain sum annually.

No. 14. That every galee, or other person holding through or under him, shall have the liberty of making up the short-workings of any year or years of his holding in any succeeding year or years, but not so as that the over-workings of any preceding year or years shall be brought forward in aid of the short-workings of any succeeding year or years.

No. 15. Should any galee be minded to give up his gale before it shall be worked out or exhausted of its coal, he shall only be permitted to do so on condition that he leave the horse-roads, hod-roads, and all other roads and passages which may be re-

quisite for working such coal as may remain in the several veins, in a free and open state and condition, fit for a succeeding galee.

No. 16. Every galee shall keep a fair and legible account-book or books, in which shall be entered the quantity of coals sent daily from each colliery, and also shall make plans of the workings of the several veins when thereunto required by the gaveller or deputy-gaveller, and the gaveller or deputy-gaveller shall have free access to such books and plans at all seasonable times, and from time to time. No tonnage to be paid on coals consumed by the engines appertaining to the gale, or for other necessary colliery purposes.

No. 17. The gaveller and deputy-gaveller, and his and their assistants, agents, servants, or workmen, duly authorized, shall be at liberty at all seasonable times, and from time to time, to enter into and upon, and to inspect and survey the workings of every colliery already opened or to be opened, and to make a plan or plans thereof.

No. 18. The galee of every gale hereafter to be granted shall leave barriers of coal in each vein, of such width, and in such situations, as may be directed or pointed out from time to time by the gaveller or deputy-gaveller.

No. 19. In all cases where gales lying on the land-side of other gales are drained by steam-engines, and when, by the stopping of those engines, the water may be thrown into dip-gales, the galees of the land collieries shall be bound to work their engine or engines so as to prevent any of the water of these gales from falling down into the dip-gales so long as they shall continue to hold possession of such land-gales; and no person or persons holding any gale or gales lying on the land-side of any other gale, not so drained by any engine, shall wilfully or by negligence suffer the water of such land-gale to fall down into such dip-gale; and no person, in working any gale in the deep of another gale or work, shall suffer the water of such deep gale to accumulate, so as to rise above the level of the workings of such deep gale, to the injury of the gale or work in the land.

No. 20. That in all cases where the boundary of a tract of coal is defined by a level driven from the bottom of a pit, the deep side of such level shall be understood as being 10 yards in the deep of where such pit strikes the coal.

No. 21. That in all cases where the boundary of any tract of coal is defined by the workings of another tract of coal, if any dispute shall arise respecting the position of such workings, the same shall be settled and determined by the gaveller or deputy-gaveller; and if the workings forming such boundary have not been carried to the extent where the adjoining tract of coal is about to be worked, then the line of boundary between the two tracts shall be in like manner settled and determined by the

gaveller or deputy-gaveller; and the orders or determinations of the gaveller or deputy-gaveller with respect to such disputed boundaries shall in every case be made in writing, either with or without reference to a plan, as may be deemed expedient, and shall be entered in a book or books to be kept for that purpose by the gaveller or deputy-gaveller.

No. 22. That all cuts out to be made by virtue of the said Award shall rise with an inclination of one inch in the yard at the least, unless leave to the contrary, in writing, shall be previously given by the gaveller or deputy-gaveller.

No. 23. That in all cases where a gale, pit, level, or work shall be opened within any enclosed lands of the said hundred, no building shall be erected, or roads or works made, other than such as shall be previously allowed by the gaveller by writing under his hand, as being absolutely requisite and necessary for the carrying on the workings of the colliery, established thereby, in the manner least injurious to the said enclosed lands.

Iron Mines.

No. 1. All persons now or at any time hereafter holding one or more gale or gales of any mine or mines of iron ore within the hundred of Saint Briavels, as ascertained by the foregoing Award, and the said first Schedule and Plans, or granted by the gaveller or deputy-gaveller, in conformity with the provisions of the aforesaid Act mentioned in the said Award, shall be entitled to the free and unrestricted use and enjoyment of all levels, drifts, drains, cuts out, and watercourses, pits, shafts, and pit heaps, belonging or appertaining to the gale or gales so holden, with liberty to dig, sink, work and drive, make and use, such levels, drifts, drains, cuts out, watercourses, pits, shafts, and pit heaps, with sufficient heap room for the purpose of winning and working, selling, or disposing of the produce of such mines so galed, nevertheless, so that the above privileges be exercised, subject to and in conformity with the provisions of the said Act and with these regulations.

No. 2. No person shall be entitled to any other vein or veins of iron ore than that or those awarded by the Mining Commissioners, or galed by the gaveller or deputy-gaveller; and any under-lying or other veins, not so awarded or galed, may be galed to other parties, but to be so worked as not to impede or injure the workings of the tracts already allotted, or hereafter to be allotted or galed.

No. 3. All persons now or at any time hereafter holding one or more gale or gales of any mine or mines of iron ore within the said hundred, either by virtue of the foregoing Award, or by grant from the gaveller or deputy-gaveller, shall also be entitled to make and form, and to have the free and unrestricted use and

enjoyment of all such railroads, and other roads as shall be deemed requisite by the gaveller or deputy-gaveller, for the proper carrying on of the work or works, opened or to be opened under or by virtue of such gale or gales, subject, nevertheless, to the previous approbation and allowance of the Commissioners for the time being of Her Majesty's woods, forests, land revenues, works and buildings, signified by some writing under their hands, and subject also to the use by the owners of other works of the said railroads and other roads, upon payment of reasonable compensation for the use thereof, the amount of compensation, in case the parties shall differ about the same, to be settled by reference to 2 disinterested persons, one to be chosen by each party in the usual way, or by their umpire.

No. 4. All persons now or at any time hereafter holding any unopened gale or gales of iron ore, either by virtue of the foregoing Award or by grant from the gaveller or deputy-gaveller, shall *bonâ fide* commence opening the same within the space of 5 years from the date of the said Award, as regards gales thereby ascertained, and as regards all other gales, within 5 years from the date of the grant thereof respectively. Provided, nevertheless, in the event of any unavoidable and unforseen mining accident or impediment occurring, or other reasonable cause of delay being proved to the satisfaction of the gaveller, to prevent the opening of such works within the said period of 5 years, then the time may be extended at the discretion of the gaveller by some writing under his hand, according to circumstances.

No. 5. No tonnage or other rent to be paid during the first 4 years of the holding for works now being opened, or hereafter to be opened, unless any iron ore shall be wrought in the mean time, in which case the stipulated tonnage shall be paid thereon to Her Majesty, her heirs and successors.

No. 6. All persons now or at any time hereafter holding one or more gale or gales of any mine or mines of iron ore shall be at liberty to give up all or any such gales, as regards the said gales, ascertained by the foregoing Award, at the end of the first 4 years from the date thereof, and as regards gales hereafter to be granted at the end of 2 years from the date of the grant of such gales, upon giving 3 months' previous notice, or at the end of any subsequent year on giving 6 months' previous notice, such notices respectively to be in writing, and to be left at the office of the gaveller or deputy-gaveller.

No. 7. No steam or fire-engine shall be erected within any enclosure, or within 60 yards of the fence of any enclosure, without the previous approbation and allowance of the Commissioners for the time being of Her Majesty's woods, forests, land revenues, works and buildings, first had and obtained, and signified by some writing under their hands.

No. 8. All persons now or at any time hereafter holding one or

more gale or gales of any mine or mines of iron ore shall be allowed 6 months from the time of giving up as aforesaid, to remove and carry away such quantity of iron ore as may then be lying upon bank at the several pits or levels of the gale, and also for removing the machinery, erections, or buildings, provided that in removing such resting, iron ore, machinery, erections, or buildings, no wilful or unnecessary impediment or hindrance to Her Majesty, her heirs or successors, or to the entering galee, shall be given; but in the event of any gale which is drained by a steam-engine or other machinery, and lying on the land-side of any other gale, worked also by steam-engine, being worked out or abandoned before such gale lying to the deep thereof, the galee of such worked out or abandoned gale shall leave at the office of the gaveller or deputy-gaveller, and also at the usual or last known place of residence of the person or persons holding such gale lying to the deep of the worked out or abandoned gale, notices in writing of his intention to discontinue the workings of his engine 3 months at least previous to such discontinuance.

No. 9. All persons now or at any time hereafter holding any mine or mines of iron ore, by virtue of a gale or gales, shall work and carry on the same in a fair, orderly, and workmanlike manner, and according to the best and most improved system for the time being of working iron mines, and shall not desist from working the same for a space exceeding 5 years at any one time after the vein of iron ore has been gained.

No. 10. In proceeding to open new works, the situation and extent of the ground which is to be occupied by each pit or level mound shall be determined by the gaveller or deputy-gaveller, and a memorandum of such situation and extent shall be entered by the deputy-gaveller in a book to be kept for that purpose, to be called "The Surface Boundary Book," and such situation and extent shall also be marked or delineated on the copy of the engraved plans to be kept in the deputy-gaveller's office; and if during the progress of any works any ground shall be applied for in manner provided by the 25th clause of the said Act, recited in the said Award, then as regards any lease which shall be obtained in pursuance of such application, a memorandum or docket of the grant thereof shall be entered by the deputy-gaveller in the Surface Boundary Book, and delineated in the plan as abovementioned.

No. 11. Any Free Miner desirous of taking a gale shall apply in writing to the gaveller or deputy-gaveller, in manner directed by the said Act, describing the situation of such proposed gale, and the names of the vein or veins of iron ore proposed to be worked; and in setting out metes and bounds to every such proposed or new gale, the gaveller or deputy-gaveller shall have regard to the probable cost of winning the ore in the spot galed, and the estimated quantity of ore to be obtained by such winning.

No. 12. Every gale hereafter to be granted shall be granted on condition that when any level, pit, or other work hereafter to be opened by virtue of a gale is abandoned or disused, the galee shall remove all buildings or works which shall no longer be necessary for carrying on such pit, level, or work, and shall smooth the surface of the ground which has been occupied by the same, and the galee shall set up at his own costs upon or about any such abandoned or disused work, such walls, fences, or other protection as the gaveller or deputy-gaveller may deem necessary for the safety of cattle; and in case of the galee's refusing or neglecting to do so within 3 months after notice given to or left for him at his last known place of abode by the gaveller or deputy-gaveller, then the galee shall pay the expense of making such walls, fences, or other protection and removal.

No. 13. That as to all gales hereafter to be granted, the same shall only be granted upon condition that the galee work and get in each and every year a certain quantity of iron ore, so that the rent, tonnage duty, or royalty, payable and to be paid to Her Majesty, her heirs and successors, shall not be less in any year in respect of ore got, than a certain sum to be expressed in and by the grant of every future gale, and such minimum quantity of ore shall be ascertained and determined by the gaveller or deputy-gaveller, or by arbitration, as is provided or referred to in the 56th section of the printed copy of the said Act; and further, upon condition that the galee do, in the event of there not being sufficient ore got to make up the certain sum by way of rent, to be so expressed, pay and make up such certain sum annually.

No. 14. That every galee, or other person holding through or under him, shall have the liberty of making up the short workings of any year or years of his holding in any succeeding year or years, but not so as that the over workings of any preceding year or years shall be brought forward in aid of the short workings of any succeeding year or years.

No. 15. Should any galee be minded to give up his gale before it shall be worked out or exhausted of its ore, he shall only be permitted to do so on condition that he leave the horse roads, and all other roads and passages which may be requisite for working such iron ore as may remain in the several veins, in a free and open state and condition, fit for a succeeding galee.

No. 16. Every galee shall keep a fair and legible account-book or books, in which shall be entered the quantity of iron ore sent daily from each mine work, and also shall make plans of the workings of the several veins when thereunto required by the gaveller or deputy-gaveller, and the gaveller or deputy-gaveller shall have free access to such books and plans at all seasonable times, and from time to time.

No. 17. The gaveller and deputy-gaveller, and his and their assistants, agents, servants, or workmen, duly authorized, shall be at liberty at all seasonable times, and from time to time, to

enter into and upon, and to inspect and survey the workings of every iron-mine work already opened or to be opened, and to make a plan or plans thereof.

No. 18. In all cases where gales lying on the land side of other gales are drained by steam-engines, and when, by the stopping of those engines the water may be thrown into dip gales, the galees of the land iron mine works shall be bound to work their engine or engines, so as to prevent any of the water of these gales from falling down into the dip gales, so long as they shall continue to hold possession of such land gales; but in all cases where the deep work shall, notwithstanding the aforesaid regulation, be unavoidably or otherwise subjected to or injured by the water from the land work, the owner of the land work shall pay compensation to the owner of the deep work for the injury done, the amount of such compensation, in case the parties differ about the same, to be settled by reference in manner pointed out by regulation No. 3, and no person or persons holding any gale or gales lying on the land side of any other gale, and not so drained by any engine, shall wilfully or by negligence suffer the water of such land gale to fall down into such dip gale, and no person in working any gale in the deep of another gale or work shall suffer the water of such deep gale to accumulate so as to rise above the level of the workings of such deep gale to the injury of the gale or work in the land.

No. 19. That in all cases where the boundary of any tract of iron ore is defined by the workings of another tract of iron ore, if any dispute shall arise respecting the position of such workings, the same shall be settled and determined by the gaveller or deputy-gaveller, and if the workings forming such boundary have not been carried to the extent where the adjoining tract of ore is about to be worked, then the line of boundary between the two tracts shall be in like manner settled and determined by the gaveller or deputy-gaveller, and the orders or determinations of the gaveller or deputy-gaveller with respect to such disputed boundaries shall in every case be made in writing, either with or without reference to a plan, as may be deemed expedient, and shall be entered in a book or books to be kept for that purpose by the gaveller or deputy-gaveller.

No. 20. That all cuts out to be made by virtue of the said Award shall rise with an inclination of half an inch in the yard at the least, unless leave to the contrary in writing shall be previously given by the gaveller or deputy-gaveller.

No. 21. That in all cases where a gale, pit, level, or work shall be opened within any enclosed lands of the said hundred, no buildings shall be erected, or roads or works made, other than such as shall be previously allowed by the gaveller by writing under his hand as being absolutely requisite and necessary for the carrying on the workings of the iron mine work established in the manner least injurious to the said enclosed lands.

ON THE LAWS AND CUSTOMS RELATING TO MINING, AND THE DECISIONS THEREON.

BY THE EDITOR.

UNDER this head it is intended to give insertion to such papers as may be of general interest and importance, illustrative of the rules observed in the working of mines, or decisions on cases discussed in our Courts of Law and Equity. The practice of the Stannaries Courts, and the nature and principle of the cost-book system, will be found fully treated upon in another part of the present volume, while the important subjects connected with tin bounds, their antiquity, and the various authorities cited in the course of legal proceedings instituted from time to time, will be also found discussed in a luminous and comprehensive manner.

We purpose in this place to confine ourselves mainly to three cases,—*Rogers* v. *Brenton*, to which we shall append some observations bearing on the point at issue,—namely, the customs appertaining to the keeping up of tin bounds; that of *Ricketts and Another* v. *Bennett and Another*, being an action for the recovery from the defendants, as adventurers in a mine, of certain moneys advanced to the purser as their recognised agent; and further to the case of *Harvey and Another* v. *Wyld*, which was lately heard in the Court of Exchequer, and which latter involves an important question, as affects the Joint-Stock Companies' Winding-up Act. Indeed, it will be self-apparent in all these cases, that it is essentially necessary, for the security of the lord, the adventurer, the merchant or banker, and the purser or agent, that the law, as laid down by the judges, should be correctly stated and comprehended.

The necessity of some legislative measure, whereby the real nature and extent of the laws and customs, as applicable to mining pursuits, and the respective rights and obligations of one and the other party, may be clearly ascertained and regulated, is manifest, and cannot be considered otherwise than of the first importance in connection with our mining industry. The Stannaries Courts, the powers of which are confined to Cornwall and Devon, are fully capable of administering those laws and customs, when clearly ascertained, and additional powers may readily be obtained from the Legislature, if needed.

It is from the uncertainty and doubt at present attendant on them, that we find, in too many instances, the chances of success are relied upon by the ignorant, or those who, from want of

principle, would rather rely on such uncertainty than act in strict accordance with truth and justice.

That some such course will be taken by Government, in concurrence with the general opinion of the county, we cannot for a moment entertain a doubt; while, in giving publicity to cases like the present, and in drawing attention to the subject, we consider our pages calculated to promote the general object of amelioration.

ROGERS v. BRENTON.

Among the various customs applying to the working of mines, that of tin bounding is one of the earliest known to the law of this country, and we may also observe that it is the latest to which attention has been directed in our Courts. A brief review of the case *Rogers* v. *Brenton* will enable our readers to appreciate the importance of the points involved in it, and the urgent necessity of some legislative or other measure, to ascertain and settle existing interests, so that no further litigation may arise. In the case under notice, the plaintiff claimed certain tin-grounds as "bounder," or as owner of a "pair of tin bounds," called Ruby Bounds, by virtue of the well-known custom of Cornwall. The cause was tried before Mr. Justice Wightman, at the Middlesex Sittings after Trinity Term, 1843, the venue having been altered from Cornwall to Middlesex, by a Judge's order, in November, 1841. On that occasion the jury found a general verdict for the plaintiff, subject to a motion for a nonsuit in the Court above, in case the Court should be of opinion that the custom was bad in law. The tin bounds were situate in the duchy manor of Helston, on the sale of which, in 1798, a right to all minerals was reserved to the duchy, but the plaintiff claimed the tin ore as executor and legatee of his father. The tin bounds had not been cut or *pitched* within living memory, nor was there any evidence as to the period of their commencement, although proof was given of the annual renewal of them for the last seventy years. Tin had been found and raised in small quantities by adventurers under the "bound-owners," and the customary toll paid to the lord at various periods ranging over some forty or sixty years. The last receipt of toll from the Ruby Bounds was in 1823, about eighteen years previous to the commencement of the action. The defendant was the agent or captain of a company of adventurers who had been working for several years within or near the Ruby Bounds, but had only raised tin ore shortly before the action. They refused to pay any farm or dues to the plaintiff, or to recognise his title as bound-owner. It did not appear, however, under whom the company claimed, although it was subsequently stated, on the motion for a new trial, that the defendant really claimed under a set from Captain Crease, the late lessee of the duchy, by whom the action was, in fact, defended. The evidence produced by the plaintiff, in support of his claim, consisted of the roll of the Stannary Convocations or Parliaments, held 22 James I., 1 Charles I., 12 Charles I., 2 James II., and 26 George II., which last recited the Acts of the previous convocations. The commissions under which the convocations 2 James II. and 26 George II. were held, were also proved, none earlier having been found. These showed that the convocation professed to make new laws, as well as present old customs. A charter of 23 Henry VII. was also put in, which, among other things, recognised bounders (*bundatores*) as being the possessors of tin works (*opera stanni*) and their obligation to enter the description of newly "bounded" works in the Stannary Court. Certain extracts from the Court rolls of the [illegible] of the four stannaries in the reign of Henry VI., Henry VII.,

Elizabeth, and James I., were also read, to prove the early existence of tin bounds, or *opera stannaria*, proclamations of them in the Stannary Court, and presentments of the custom generally. Ministers' accounts rendered to the Crown by officers of the duchy were likewise produced, to show the receipt by the lord of the manor of "toll-tin" from tin-works, the toll-tin being explained to mean the customary dues payable to the freeholder out of bounded tin-mines. Leases by the Crown and duchy of "toll-tin" belonging to the duchy, and also of "tin-mines" in enclosed lands, were also proved, and other evidence adduced, with the view of showing the existence of "bounded" tin-mines rendering toll to the lord of the manor. The parol evidence was given by mine-agents, solicitors, land-agents, and old "tollers," or persons employed to renew bounds and collect tolls; from whom it appeared that the custom prevailed in different parts of Cornwall, and that dues to a large amount had been paid to the owners of tin bounds, the customary toll to the landowner being one-fifteenth, which was occasionally varied by special agreement. They all agreed that, after being legally set on foot, the bounds could be preserved by mere annual renewal of the turfs or mounds at the corners, without working. Some of the witnesses doubted whether even this ceremony was strictly necessary, except as evidence of the right. Only one instance of newly-proclaimed bounds was recollected by any witness; all the wastes of the tin-mining districts being supposed to have been already secured under ancient bounds. No evidence was offered on the part of the defendant, but his counsel contended that the custom did not support the declaration; that it was bad unless it implied the necessity of working; that the documentary evidence was all consistent with a custom so qualified, and that the parol evidence was vague and self-contradictory. Mr. Justice Wightman, after commenting on the proofs, told the jury that it was for them to say, upon the evidence, whether the custom existed, in fact, without regard to its legality; that, if working was essential to the custom, they should find for the defendant, but if the custom was that bounds, duly proclaimed and renewed, gave an exclusive right to the tin, then they should find for the plaintiff. In the Michaelmas Term following, Sir W. W. Follett obtained a rule *nisi* to set aside the verdict and enter a nonsuit, on the ground that the alleged custom was not proved, the witnesses varying in their statements; some alleging that even annual renewal was unnecessary; that working was necessary in order to keep up the right; that the toll taken had varied; that there was no satisfactory evidence of any working by bound-owners, adversely to the landowner,—with other points, were raised by the learned counsel, which are not of sufficient general importance to require notice here; and that the custom, as claimed, was, at all events, bad in law, as being a custom to take a profit in the soil and freehold of another, undefined and unreasonable, and tending rather to prevent the working of mines than to encourage it. The case was argued on January 23rd, 1845, before Lord Denman, C. J., Judges Patteson, Coleridge, and Wightman; and on December 8th, 1845, before the Chief Justice, and Judges Patteson and Wightman. Messrs. Kelly, Smirke, and Montague Smith showed cause. They contended that the custom proved, and found by the jury, supported the verdict either on one or the other count. It was immaterial to the plaintiff whether his right was corporeal or incorporeal; the only question being whether the custom could be maintained in point of law. The learned counsel, in the course of the arguments used, commented on the cases which had been submitted to the Court, to show the custom to be unreasonable and void; while, in the case of mines worked under the custom in question, the owner of the land subjected to tin bounds was entitled to receive toll, generally one-fifteenth; a charge so considerable that few landowners would object to their mines being worked

on such terms. Until the recent abolition of the coinage duty, by stat. 1 & 2 Victoria, c. 120, the prince received *jure ducatûs* a duty of 4s. per cwt. on all the tin smelted in Cornwall, which could not be exported from the county until it had been brought to be examined and stamped at certain coinage-halls appointed by him. The existence of this customary payment could be traced to the earliest period of which there was any public record. The right also of pre-emption of all tin in the county could be shown to have been exercised for centuries, and was upheld in the "case of the Stannaries," where it is expressly called a profit *à prendre*. Customs analogous to that of tin bounding also prevailed in other counties, the rights of the free miners of the Forest of Dean being recognised and regulated by stat. 1 & 2 Vict., c. 43. Those of the Derbyshire lead-mines also strongly resembled the Cornish custom, and would appear to be firmly established ever since an inquisition of 16 Edward I. The custom, as claimed in Cornwall, fulfilled all the three conditions of a good custom; for the party bound had a benefit, the party claiming was at some charge, and the usage might have a reasonable commencement. It had been before the Court in several cases cited by the learned counsel, and was admitted in its fullest extent in *Vice* v. *Thomas*, determined by the Lord Warden of the Stannaries, with the advice of five judicial members of the Privy Council. It had been contended that, although a custom to work mines in the land of another, which the owner will not work himself, may be sustained on public grounds, the custom as here asserted is to appropriate mines without any obligation to work at all; and that the custom in this form had no other operation than to change the property, without securing to the community any benefit from it. This, it was admitted, was the most plausible objection to the claim, but did not leave it without strong grounds of support. Cornwall had, for many centuries, been a constituent part of the realm, but its ancient relation to and connection with England was rather of Wales or Scotland, than of an English county. It probably had its own usages and laws, differing widely from the common law, of which its remarkable mining customs might be the vestiges. In *Doe dem. Earl of Falmouth* v. *Alderson*, Baron Parke treated the custom of bounding as one not governed by ordinary rules, but rather as a sort of "common law of Cornwall." The custom proved to exist was unqualified, except by the condition of annual renewal. If this was not enough to support the custom, no tin bounds could be upheld as subsisting; for, although the whole of the wastrel of Cornwall is said to be under bounds, there are certainly none in which continuous working can be shown.

Sir Thomas Wilde, with whom were Messrs. Crowder and Butt, appeared on the other side, and argued that the custom, as proved, was uncertain and unreasonable; the usage ought to be clearly defined in order to establish a right of this kind, whereas here it was left in uncertainty as to the necessity of renewal, the times at which, if necessary, the renewal was to be made, the mode of bounding, and the extent of the bounds. There could be no doubt *some* custom did exist, and it might easily have originated in the willingness of a landowner to permit adventurers to work mines in his waste on payment of dues; but the custom now claimed was to turn up four corners in another man's land, including an area of any extent, thereby to divest the whole property in the tin-mines out of the landlord, without any reasonable security that he will ever be permitted to receive the dues, or the public derive any benefit from the transfers of property.

The cause stood over until Trinity Vacation, 1847, when Lord Denman, C. J., delivered the judgment of the Court, in the course of which he observed that the question in this case turned upon the validity of a custom, or local usage, which was represented as being a right to raise tin as a bounder, while, on the part of the defendant, it was contended that such a

custom could not exist in law, and consequently that the right laid in the declaration was not proved. The argument had proceeded on two grounds, the plaintiff contending that, first, considering it was a mere custom to be tried by the ordinary tests, it was not unreasonable; and secondly, that it was the local law of an extensive district, anterior in origin to the date when Cornwall became part of, and subject to, the general law of England; and that its effect was not to create merely an easement to be enjoyed in the land of another, but a tenement. His lordship proceeded to observe on the custom of bounds, and, supposing an obligation to work existed, admitted its reasonableness, as fulfilling every requisite of a good custom, in enabling a mine to be worked where the owner of the soil could not or would not do it for himself. But the real question was whether the customary right of bounding could exist without continuing *bonâ fide* to search for tin, and whether it was sufficient merely to renew the bounds annually by a new cutting the turfs as at the commencement. Assuming the validity of the custom, if the *bonâ fide* working be made, and that it is a custom which is to be tried by the tests established by the common law for ascertaining whether a custom be good or not, it appeared to his lordship that, without such qualification, it could not be sustained. Customs, especially where they derogate from the general rights of property, must be construed strictly, and above all things they must be reasonable, while "bounding" was a direct interference with the common-law rights of property, and the public interest might suffer from the bounder possessing himself of tin bounds, and neglecting or refusing to work the same, whereby the supply of the metal might be limited, and the price enhanced, at the same time that the lord derived no advantage from the working his mine, and was moreover precluded from carrying on operations, however anxious he might be to do so. The condition that the bounds should be annually renewed by cutting the turfs was useful for determining the limits, and also preserving evidence of ownership, but could not be held as a substitute for the working itself. After referring to the conflicting evidence given in the course of the hearing of the cause, his lordship observed, "We see every reason to believe that the unqualified right now claimed is but an abuse of the original limits of the custom, inconsistent in its object, and not to be sustained on any principle." The only remaining point made by the plaintiff was, "that bounding was not to be tried merely as a custom, limited in local extent, and as an exception to the general rules of common law, but as the local law of a distinct and extensive district, having its origin earlier than the time when Cornwall became part of England, or subject to its general laws. This point was argued with much learning and ingenuity by Mr. Smirke, but we think his argument failed in respect of such historical certainty of fact as is necessary to build any legal conclusions thereon; further, assuming that difficulty overcome, we think it failed on legal authority." His lordship, in conclusion, observed that "the ground of inconvenience which might result from our decision in favour of the defendant was not much pressed in the argument before us; but we collect from the report that it appeared in evidence that tin bounds had for a considerable period been made the subject of conveyance, settlement, and devise; and it is possible, therefore, that inconvenience may result where there has been such a neglect of working as to forfeit the title to them. We have not been insensible to this, and have given it our consideration; but it has not appeared to us to warrant a change in our conclusion, which ought to rest on legal grounds only. If the inconvenience be so great as may be apprehended, it is better that it should be remedied by the legislature than be made a reason for our coming to a conclusion which those grounds will not warrant. We do not apprehend, however, any such inconvenience. Nothing we have said compels

the bounder to strictly continuous working; such reasonable time for consideration, preparation, and due selection of places and planes, must always be allowed as the nature of the undertaking reasonably requires; and, when he has once *bonâ fide* worked, his ceasing to work for a time will be therefore open to explanation, so as to prevent a forfeiture. It is only when the conduct of the bounder is such as to warrant the conclusion that he has ceased to be, in good faith, pursuing that object which alone justified his entry on the land, and which is the reasonable foundation of his title.

"The present is such a case. We understand it to be admitted that, for many years, the bounder has ceased to work, and cannot succeed unless the custom, unqualified according to the statement in the commencement of our judgment, can be sustained. We are of opinion that it cannot; and therefore our judgment must be that a nonsuit be entered, according to the leave reserved." Rule absolute for a nonsuit.

RICKETTS AND ANOTHER *v.* BENNETT AND ANOTHER.

This cause was tried before Baron Platt, at the Summer Assizes, 1846, in Cornwall.

The plaintiffs were bankers at Penzance, and the defendants, two of the co-adventurers in a mine called Wheal Providence, which was worked upon the cost-book principle, and divided into 128 parts or shares, the defendant Bennett holding four shares, and the other defendant five and a half, both having become connected with the concern about June, 1844. Mr. A. Robinson, a co-adventurer, who acted as manager, opened an account with the plaintiffs in September, in the names of the Wheal Providence Adventurers, the several cheques being signed by him, on their behalf, or by his son, who acted in the capacity of purser. It appeared that between the time of opening the account and December, 1845, a debt of £3,668 had accrued, being advances made by the plaintiffs on cheques so signed, for the recovery of which the action was brought. Mr. A. Robinson, who, with his son, held ninety-nine shares, was called as witness for the plaintiffs, to establish their claim, when he admitted that he had no *express* authority to borrow money on account of the mine, and, moreover, that the defendants had had no notice of his having done so. He stated, however, that nearly all the money he had obtained had been expended for the purposes of the concern. It appeared in the course of his evidence that both the defendants had, from time to time, attended at the mine, and that the pass-book was kept at the counting-house, but he, the witness, could not say that either of them had ever seen it. It further appeared that, within a fortnight after the account with the plaintiffs being first opened, he, the witness, had obtained an advance of money from them for the express purpose of making a dividend; the defendants had received their proportion of the dividends so declared, as also two other dividends subsequently, but that they had no knowledge that the money had been borrowed for that purpose; the first intimation that they had of the fact was the demand made upon them for the balance due to the plaintiffs, in December, 1845, which they at once repudiated. No evidence was offered on the part of the defendants, but it was insisted that the mere relation of co-adventurer in a mine did not give authority to the manager to pledge the credit of the whole body for money borrowed. The learned judge told the jury that, generally speaking, one partner in a mining concern has no authority to bind his co-adventurers for money borrowed, but that such an authority might be inferred from the surrounding circumstances. He left it to the jury to say whether, upon the facts proved, they could infer that Robinson, the manager, had borrowed the money in question with the assent of the defendants; the

jury returned a verdict for the defendants. In the succeeding Michaelmas Term, Mr. Crowder obtained a rule *nisi* for a new trial, on the grounds that the mere fact of partnership between Robinson and the defendants gave an implied authority to pledge the credit of the latter, and that the verdict was contrary to the evidence. The case was fully argued by Crowder, Serjt. Channell, and Smirke, for the plaintiffs, and Butt, Serjt. Kingslake, and Merivale, for the defendants.

In Trinity Term, 1847, Chief Justice Wilde, in giving judgment, observed that he believed the opinion to be quite correct which had been advanced in the course of the arguments, that of the business of a mine being carried on quite differently from that of an ordinary trading firm: regular calls were made in the former case, as money was required for the purpose of the partnership, which were paid down, and the directors had only authority to manage the concern with the funds so supplied, but not to pledge the credit of individual shareholders. No evidence, the learned Judge observed, had been given of any usage as to borrowing of money by mining adventurers, or any evidence of necessity. The defendants appeared never in any way to have interfered in the management of the concern, and it was sought to charge them simply on the ground that they were co-adventurers with the Robinsons, who had borrowed the moneys from the plaintiffs. No question had gone to the jury as to whether the plaintiffs had notice of Robinson's misapplication of part of the money. The learned Judge concluded his judgment in the following words: "I incline to think that there was cogent evidence that the plaintiffs dealt with the Robinsons only, but that point does not now arise. I assume that the money was advanced upon the credit of the mine, and that the plaintiffs had no notice that it was applied otherwise than to the purposes of the mine; but upon the facts supported that there was no evidence to warrant the jury in coming to any other conclusion than they had done, it was left to them, broadly and correctly, that the defendants were not liable simply because they were co-adventurers, but that they might employ an authority in Alexander Robinson, to pledge the credit of the defendants for what was necessary to the successful management of the mine, and was usual; the jury must, therefore, be taken to have found that the borrowing of money was not necessary for carrying on the business of the mine, and that it was not usual. We are therefore of opinion that the direction of the learned Baron was correct, and that the jury came to a proper conclusion upon the evidence that was before them; and, consequently, that this rule must be discharged." Rule discharged accordingly.

It will thus be seen, as the result of the last-mentioned case, that one of several co-adventurers in a mine has not, as such, any authority to pledge the credit of the general body for money borrowed for the purposes of the concern; the fact of his having the general management making no difference, in the absence of circumstances from which an implied authority for that purpose can be inferred. It was not doubted, nor can it be denied, that the manager of a mine is fully authorized, as such, to enter into all needful and usual contracts for the management and effective working of the mine. It is essential to the interests, both of creditor and adventurer, that such an authority should be presumed to exist. Without it, no merchant could safely supply materials without previously ascertaining the will of every one interested in the adventure; and the concern itself,

would fail for want of the credit which is indispensable to the success of every commercial enterprise. It is equally certain that it is both usual and expedient that the managing partner or agent in a mine should open a banking account, and there seems to be no reasonable objection to his opening it in the name of the general body of adventurers. So large a portion of the dealings of such a company is carried on through the medium of bills and drafts, that the employment of a banker is almost unavoidable. But the power to overdraw the account, which is equivalent to borrowing money of the banker, is one which it cannot be said to be either necessary or expedient for a mere agent to possess. In every well-regulated company, whenever the receipts of the mine do not cover the expenses, it is the clear duty of the managing partner or agent to signify the deficit to the shareholders, and to make a call to supply it. To avoid the necessity of a call by borrowing money without the privity of the shareholders, has the effect of concealing from them the real state of the mine; and where (as in *Ricketts* v. *Bennett*) the borrowed money is applied to the payment of dividends, which the concern is not in a condition to pay, it is plain that there can be no other object in view than to create a false security in the minds of shareholders, and to give a fictitious credit to an unsuccessful speculation. Wherever a loan may be desirable (and extraordinary expenses may frequently require such temporary accommodation) it should be the subject of a special resolution of the general body, expressly authorizing the agent to contract for it.

We cannot, therefore, regret the decision of the Court in the above case, nor apprehend from it any real injury or impediment to the free and healthy operation of credit in mining adventure, whether carried on upon the cost-book principle, or on any other system.

FOX AND OTHERS *v.* WYLD, M.P.

COURT OF EXCHEQUER, 7TH DECEMBER, 1848.

This was an action brought by the plaintiffs, who are merchants in Cornwall, against the defendant, as an adventurer in the Wheal Lovell Mine, for the recovery of the sum of £161. 8s. 2d., for materials furnished to the mine. The holding of five shares by the defendant in the adventure was clearly proved by Capt. R. S. Bryant, the agent of the mine, who deposed to the defendant having signed the transfer-book to such extent. The cost-book being put in Court as further evidence, and the signature of the defendant proved by the witness, it appeared that, out of 500 shares into which the company was divided, not more than seven-tenths had been subscribed for; and hence it was contended on the part of counsel for the defence, that the company had not been formed, and consequently the defendant was not liable. Another point raised was that, having subsequently relinquished his shares, he was no longer liable for the debts of the company, and that, moreover, there had been deception practised. The defendant, it appeared, had paid a

deposit of £5 per share, and subsequently finding the mine to be in debt, he gave notice of his intention, under the Joint-Stock Companies' Winding-up Act, to move for the dissolution of the company, it being in an insolvent state. The case of *Pickford* v. *Davis* (5 Mees. & W. 2) was cited as a precedent. The Lord Chief Baron, however, was of opinion that the defendant, having signed the cost-book, and being cognizant of the working the mine, had thereby given authority to the purser or other agent to pledge his credit as one of the adventurers. With reference to the objection that the whole of the shares had not been subscribed for, his lordship expressed himself clearly, that, had the defendant alone signed the cost-book, however small might have been the interest held by him, yet he was liable to the full payment of the claim. In the end, a verdict was taken for the amount of materials furnished up to a given time, being the date when defendant contended he had relinquished his interest, and consequent liability.

It will thus be seen that in the opinion of the Lord Chief Baron, no matter whether the entire number of shares are taken up or not, if an adventurer, however slight his interest, shall have signed the cost-book, he makes himself responsible for the entire debts and obligations of the company. To have acted strictly in accordance with the cost-book system, we think the defendant erred in not tendering his proportion of the liabilities and debts which had been incurred at the time of the relinquishment of his shares, claiming his proportion of any assets belonging to the mine, as also the value of the machinery and ores at surface: this not having been done, he made himself liable to be proceeded against individually, for any debts incurred by the mine, the result being a verdict against him with costs, leaving him to adopt such measures as he might be advised, to proceed against his co-adventurers for their proportion after having first deducted the amount of calls due by him. The question in itself involves many points of importance to adventurers generally, inasmuch as the costs, which we believe to amount to threefold that of the verdict, raise the question as to who are the parties to be called upon to defray the same.

The next step taken was an application in the following week to the Vice-Chancellor by way of petition, presented by the defendant, under the Act already referred to, praying for a dissolution of the company, one of its clauses providing that any action brought against any contributory of a company for any debt contracted, and in case certain measures should not have been taken for the payment of such debt, or such action have been stayed, or an indemnification given to the defendant, to his satisfaction, against such action, then that the contributory may petition the Court in the manner above stated. Mr. Wigram, who was counsel for the plaintiff, submitted that this was not a company coming within the meaning of the Act; and, secondly, that the petitioner was not in a position to claim any benefit under the Act, he having relinquished his shares in the mine in November, 1846. Both these objections were overruled by the Vice-Chancellor, who stated that it was quite evident, in this case, that it was an attempt to make a contributory pay the debts of the company, and that the company had set a creditor upon an adventurer, probably with the view of forcing him to pay calls. This was a proceeding he could not sanction, and was by no means creditable. On the part of Mr. Wyld it was distinctly

stated, that he only claimed an indemnity from the company from the consequences of the action brought against him. If this indemnity was given, or the debt and costs paid, he had no wish that the company should be dissolved. The Vice-Chancellor eventually made an order that the costs in defending the action be ascertained, and that Mr. Wyld be at liberty to pay the debt and costs of the plaintiffs in action, and also his own costs; and if, within a week after such payment, a notice thereof being left at the counting-house of the mine, such debt and costs should be not paid on the part of the company, less any amount found to be due from him, the defendant, in default of such payment, then that the company be absolutely dissolved.

It would thus appear that in the opinion of the Vice-Chancellor the Joint-Stock Companies' Winding-up Act controlled the proceedings of mining companies, although carried on upon the cost-book system; such companies having been expressly exempted, by the 63rd clause in the Joint-Stock Companies' Registration Act, from the operation of any of its provisions; while that first cited, known as the Winding-up Act, was expressly made to correct certain errors or omissions which had been committed in the 7th and 8th Vict., c. 111, and 8th and 9th Vict., c. 98.

The Vice-Chancellor, in his judgment, expressed his opinion that the early clauses in the Winding-up Act clearly comprehended mining companies.

An appeal to the Lord Chancellor to discharge the order so made was heard on the 25th and 26th ultimo, when the facts mentioned in the preceding reports were brought before the Court.

Mr. Rolt and Mr. Follett appeared for the company to support the appeal, and contended that mining companies were excluded from the operations of the Winding-up Act, and that such Act only extended to joint-stock companies within the meaning of the 7th & 8th Vict., c. 111, and 8th & 9th Vict., c. 98, being the Acts recited in the first section of the Winding-up Act. They also contended that, if his lordship should be of opinion that mining companies did come within the operation of the Act, then that this was not a case in which the Court would exercise its discretion, in making an order to wind up the affairs of the company, it being in a perfect solvent state, and the other contributors anxious of carrying on the company.

Mr. Bacon and Mr. J. H. Palmer appeared for Mr. Wyld, and submitted that the Act clearly included mining companies, inasmuch as the second section was expressly framed to meet all associations or companies formed for the purpose of working mines and minerals. It was also shown that the company had been working for four years at a very considerable loss, and were now considerably in debt; and further, that the present action had been brought at the instigation of Mr. Carne, for the purpose of forcing the defendant to pay amounts claimed, to which he considered he was not subject, and from which no adventurer would be safe, from innumerable actions that might be brought for such purpose. It was also submitted, that the Court had not released Mr. Wyld from the calls due, as, by the order made, the amount of calls due as his quota would be paid by him. The requisite notice to the company had been given, and it was contended that the appeal must be overruled.

The Lord Chancellor delivered judgment on the 29th, and said, the first question was, whether mining companies of this description were included within the operative parts of the Act in question, the 11th and 12th

Victoria. His lordship then read the sections of the Act referring to companies which it was intended to apply to, and said that the second clause was the only one that appeared to embrace these particular companies. That section, however, he thought, was only intended as a further description of those companies which were intended to be affected by the Act. Now, as a guide in ascertaining what companies were contemplated by the present Act, it was manifest that various companies were excluded from an antecedent Act, of which this was only an amendment, and that these sorts of mining companies were clearly so excepted. The new Act went on to state which of the before-excluded companies should come within its operation, and there no mention was made of the mining companies. The better construction of the Act, therefore, seemed to be, that these mining companies were still excepted from the new Act, notwithstanding that they were mentioned in the second section, as this section must be taken merely to refer to those companies which were expressly brought within the operative clauses of the Act. Then, with respect to the discretion of the Court, he (the Lord Chancellor) thought that, even if the company had been within the operation of the Act, this Court ought not to permit the petitioner to put in force the powers of an Act of Parliament that was never meant to apply to such a case. The object of the Act was only to enable shareholders to dissolve a company when the company was unable to meet its pecuniary liabilities. For this purpose certain tests of insolvency were pointed out—one of which was that of an action brought against a shareholder, and a refusal by the company to indemnify him. This, however, had in view a *bonâ fide* claim against the company, and not, as in the present case, an action arising from a quarrel between Mr. Wyld and the plaintiff, with which the company had nothing to do. On both the grounds of appeal, therefore,—first, that the company itself did not come within the provisions of the Act, and second, that if it did, the Court had a discretion in the matter, which it would not exercise in such a case in favour of the petitioner—the order of the Court below must be reversed.

It will be apparent from the proceedings in the several courts, that the opinions entertained by the Lord Chancellor and Vice-Chancellor are at variance, while the Lord Chief Baron has laid down a principle which cannot but be considered as dangerous. We have entered at length into the proceedings, that mine adventurers may know what they have to expect, if that the cost-book system be not strictly adhered to; as, in such case, with the settlement of accounts every two months, litigation could not take place in the month of December, 1848, for goods supplied in the month of January, 1846, or nearly three years antecedent. The question is treated on in a separate paper, and we doubt not but that legislative measures will be taken to prevent the recurrence of similar proceedings.

ABSTRACT OF AN ACT

FOR THE

REGISTRATION, INCORPORATION, AND REGULATION OF JOINT-STOCK COMPANIES.

[7 & 8 VICT., c. 110.]

THIS Act applies to all companies or partnerships where the capital is divided into shares, so as to be transferable, which at its formation, or by subsequent admission, consists of more than twenty-five members; but only to such partnerships, the formation of which shall have been subsequent to the 1st of November, 1844, except where the provisions of the Act are expressly applied to partnerships then existing.

Companies for executing parliamentary works, such as bridges, roads, &c., which cannot be carried into execution without the authority of Parliament, are excepted from the powers of the Act; as also any company incorporated by statute or charter.

Notwithstanding, however, these general exceptions, *all* companies are brought within some one or other of the provisions of the Act.

It may be observed that the Act does not apply to Scotland, unless the company is established there, and has an office in any other part of the United Kingdom. Nor does it to any company unless established for some purpose, commercial, or of profit, or for insurance.

The following institutions do not, however, come within the operation of the Act; viz., Banking Companies, Schools, and Scientific and Literary Institutions, Friendly, Loan, and Benefit Building Societies; and further, any partnerships or companies formed for the working of mines, minerals, and quarries, of what nature soever, on the principle commonly called the cost-book principle; as well as Irish anonymous partnerships.

All companies commenced after 1st November, 1844, must register the name, purpose, and the principal place of business. And thereupon such companies become entitled to a preliminary certificate of registration—a certificate of complete registration being further necessary so as to confer on any such company the powers and privileges of the Act.

Notwithstanding the incorporation of any company, such company, its members, and officers, are liable to be sued in respect of any obligation incurred before such incorporation.

Companies for executing parliamentary works are excepted from the general operation of the Act; but promoters are, in common with promoters of other companies, restrained from making public their intention to form a company until they shall have registered the name and business of company, and the names, &c. of promoters, and obtained certificate of provisional registration, and cannot act otherwise than provisionally until they have obtained a certificate of complete registration.

On complying, however, with standing orders of House of Commons as to documents and register copies thereof, they become entitled to a certificate of complete registration.

The Act also applies to assurance companies and friendly societies, making assurance on lives to an extent upon one life, or for one person, to an amount exceeding 200*l.*, the formation of which company or society shall be commenced after 1st

November, 1844. Provided (except by the Act specially provided) it shall not extend to any company incorporated, nor to any company authorized to sue or be sued.

Existing assurance companies are required, within three months from that day, to register the name, purpose, and principal place of business, who are thereupon entitled to a certificate of registration.

PROMOTERS.

Before proceeding to make public the intention to form a company, the promoters, or some of them, are required to return particulars according to schedule of Act; or if they appoint, and register the appointment of a solicitor, he is then required to make the returns.

Upon registration of name and business of company, and of the promoters, a certificate of provisional registration may be obtained.

ACT OF PARLIAMENT.

Companies incorporated by Act of Parliament after complete registration, are not required further to register.

Any person entitled to a share, and who has executed the deed of settlement, shall be deemed a shareholder, who must covenant to pay instalments and to perform the several engagements in the deed, and whose liability, as a shareholder, continues until a return be made of the transfer.

Shareholders become an incorporated company on complete registration, but their liability is not thereby restricted; and they are not entitled to receive dividends, or to powers given to shareholders until they have executed deed of settlement, and paid up all instalments or calls, and shall have been duly registered. They, moreover, cannot transfer any share, if the calls made thereon shall not have been paid.

Every judgment against any company completely registered may be enforced against any shareholder, or any former shareholder (within three years) if he was a shareholder at the time of the contract, the foundation of the judgment.

Shareholders are, however, entitled to be reimbursed by contributions.

The liability of shareholder applies only to those companies, the formation of which shall have been commenced after 1st November, 1844.

The following will be found a brief ANALYSIS of the ACT:—

The first section enacts as to the appointment of officers of registration, and the establishment of a registry office.

Sect. 2. The Act to apply to every joint-stock company established in Great Britain and Ireland, for any purpose of commerce, profit, or assurance, with certain exceptions; and the term "joint-stock company" to comprehend every partnership whose capital is divided into transferable shares, and every partnership which shall consist of more than twenty-five members.

Sect. 4. Before the publication of any prospectus to form a company, the promoters are required to make a return of the name of the intended company, its business or purpose, the names and residence of its promoters, committeemen, officers, and subscribers, and other particulars specified in the Act; after which they will be entitled to a certificate of provisional registration.

Sect. 5. Penalty of 20*l.* for neglecting to make the required return for one month.

Sect. 6. If a solicitor be appointed, he is then required to make the return and will be responsible for neglecting to make it.

Sect. 7. Joint-stock companies are only to act provisionally, until a certificate of complete registration is acquired. In all deeds there must be an appointment of at least three directors and one auditor; and a schedule, setting forth, in a tabular form, the name and business of the company, the amount of capital, number of shares, &c., together with certain covenants by the shareholders, and other particulars specified in the Act, which must be signed by at least one-

fourth (in number and value) of the subscribers, and certified by two directors. On such deed being perfected, a certificate of complete registration to be granted. Any defect or omission in the deed may be supplied by a supplementary deed.

Sect. 10. The directors of all joint-stock companies, not incorporated by Act of Parliament, must, after complete registration, transmit to the registrar a copy of every supplementary deed of settlement within a month after its date, together with an abstract within six months, under a penalty of 20*l.*

Sect. 11. Every January and July the directors are required to make returns of transfers of shares, and the names and residences of persons who have ceased to be shareholders, or have become such, under the like penalty.

Sect. 13. Until the return of a transfer, the party becoming a shareholder is not to act as such, or to receive any profits; and the previous holder is to remain liable to the debts and engagements of the company.

Sects. 14, 15. Every company completely registered shall make an annual return, and the registrar shall give a certificate thereof; which certificate shall, in the absence of evidence to the contrary, be received in evidence.

Sect. 16. Before complete registration, the promoter's solicitor shall sign all returns; after which the directors shall make the returns.

Sect. 17. The Board of Trade may make regulations as to the form of returns, or dispense with any of the returns required by the Act.

Sect. 18. Any person may inspect returns and registers at the office, on payment of certain fees; and all such copies or extracts shall be received as evidence.

Sect. 19. The Board of Trade to appoint a registrar, and, if necessary, an assistant-registrar, and other officers, and make rules for the regulation of the office.

Sect. 23. A company provisionally registered may act provisionally for twelve months from the date of the certificate, but no longer, unless the certificate be renewed, which may be done on application for that purpose; and a renewed certificate shall only be in force for twelve months. Provisional registration will authorize the promoters of the company,—

To assume the name of the company, coupled with the words "registered provisionally;" as also, to open subscription-lists; to allot shares, and receive deposits at a rate of 10*s.* for every 100*l.* on the amount of every share; and, in the case of companies for executing parliamentary works, such further sum per 100*l.* on the amount of every share as may be required by the standing orders of either House of Parliament to be deposited before an Act can be obtained; and to perform such other acts only as are necessary for constituting the company but not to make calls, or to contract for the purchase of land, or for services, or the execution of works, or supply of stores, except such as are necessarily required for the establishment of the company.

Sect. 24. Promoters and other persons, who make any contracts before provisional registration of the company, are liable to a penalty of 25*l*

Sect. 25. Upon complete registration, the company shall be incorporated from the date of the certificate, and are empowered to use the registered name of the company, adding thereto "registered;" to have a common seal; to sue and be sued in their registered name; contract for works, supplies, &c.; purchase land; issue certificates of shares; receive instalments from subscribers; borrow or raise money within prescribed limits; declare dividends; hold general meetings; make by-laws; and further, do all other acts necessary for carrying on their business as a company.

The company are further required to appoint not less than three directors, to be in office no longer than five years; and one auditor, with such other officers as the deed of settlement authorizes.

Sect. 26. No shareholder shall be entitled to exercise his rights until he has executed the deed of settlement, paid up all his instalments, and been duly registered; after which every shareholder shall be entitled to be present at all

general meetings; to take part in the discussions; to vote in the determination of all questions, either in person or by proxy; and also in the election of directors and auditors.

Such powers to be subject to the provisions of this Act, and to the deed of settlement; and if any subscriber to a company which has not been completely registered, or who has not been registered as a shareholder, shall dispose of any share, he shall be liable to a penalty of 10*l.*, and the contract void.

Sect. 27 defines the powers and duties of directors.

Sect. 28. No person is to be a director unless he holds one share.

Sect. 29. Directors who become bankrupt are to vacate their office.

Sect. 32. Entries of proceedings at meetings, signed by the chairman, and sealed with the common seal, to be *primâ facie* evidence of the proceedings, and of their regularity.

Sect. 33. The books are to be open to the inspection of shareholders, subject to the provisions of the deed of settlement or any by-law.

Sect. 34. Directors to keep account-books.

Sect. 35. Balance-sheet to be made out fourteen days before the account-books are delivered to the auditors.

Sect. 36. To be produced at every ordinary meeting of shareholders.

Sect. 37. For fourteen days before each ordinary meeting, and a month after, shareholders may, subject to by-laws and the deed of settlement, inspect the account-books and balance-sheet, and take copies and extracts; and may inspect them at any time by leave of three directors.

Sect. 38. Every company completely registered shall annually appoint one or more auditors, and return their names to the registrar. If no auditor be appointed, the Board of Trade may appoint one. And the commissioners of the Treasury may fix the salaries of auditors, to be paid by the companies.

Sect. 39. Twenty-eight days before the ordinary meeting at which the balance-sheet is to be produced to the shareholders, the directors shall deliver the accounts and balance-sheet to the auditors, to be examined.

Sect. 40. The auditors may inspect the books at any time, and require the assistance of the company's servants for the performance of their duty.

Sect. 41. The auditors to make their report within fourteen days after the receipt of the balance-sheet and accounts.

Sect. 42. Ten days before the ordinary meeting, the directors shall, subject to by-laws and the deed of settlement, send to every shareholder a printed copy of the balance-sheet and auditors' report, which shall be read at the meeting, together with the directors' report.

Sect. 43. Fourteen days after the meeting, the directors to send a copy of the balance-sheet and auditors' report to the registry-office, to be registered.

Sect. 44. All contracts with companies completely registered must be in writing, signed by two directors, and sealed with the common seal, or signed by some officer specially authorized, otherwise they will be void, except against the company on whose behalf they are made.

Sect. 45. Bills of exchange and promissory notes (where the directors of a company are authorized by deed of settlement or a by-law to issue or accept them) may be made or accepted by and in the names of two directors, but must be countersigned by the secretary. No secretary or other officer is to be liable on his signature to any bill or note, further than he would be liable as a shareholder; but the company may sue and be sued, in the same manner as if the contract had been under seal.

Sect. 46. All instruments under the company's seal must be signed by two directors.

Sect. 47. By-laws to be of no force till registered; to be printed and circulated among the shareholders.

Sect. 48. A written or printed copy of by-laws, having the registry-seal affixed, to be evidence.

Sect. 49. Directors to keep a register of shareholders, with an entry of their addresses, number of shares, &c.

Sect. 50. Such register may be searched by shareholders, and copies required.

Sect. 51. Every shareholder shall be entitled to a certificate of proprietorship, which shall specify the amount of his share, and what he has paid up; for which he shall not pay more than 1s.

Sect. 52. Such certificate to be *primâ facie* evidence of title.

Sect. 53. If lost or worn out, a new one may be obtained.

Sect. 54. Shareholders may, subject to the regulations of this Act and of their deed of settlement, transfer their shares by deed, according to a form given in the schedule. The directors are to cause a memorial of transfer to be entered in a book, called "The Register of Transfers;" and until the transfer has been produced at the office of the company, the purchaser cannot vote or receive profits as a shareholder. But no shareholder (without an express provision in the deed of settlement) shall transfer his shares, until he has paid up all his instalments.

Sect. 55. The company may sue any shareholder for his instalments, and recover them with interest of five per cent., on proof that he was a shareholder when the instalments became due.

Sect. 56. If any share be held jointly by several persons, notices to be given to the person whose name stands first on the register, who shall be entitled to vote, &c.

Sect. 57. At every principal place of business shall be kept copies of an index or abstract of the deed of settlement, approved by the registrar, and a list of the shareholders, directors, &c., and a copy of the by-laws; which may be inspected at any reasonable time by any shareholder, or person authorized by him in writing.

Sect. 62. If at any time in five years after the 1st day of November, 1844, a memorial be presented by any company (except assurance companies), to the Board of Trade, applying for a dispensation or modification of any of the conditions and regulations of this Act, and such application be registered, and three times previously advertised at intervals of a week in the *Gazette*, the Board of Trade may at any time in that period, or six months after, dispense with or modify such conditions and regulations, by an order in writing which must be registered; and a return of such application and the order made thereon shall annually be made to Parliament.

Sect. 63. The Act not to apply to any partnership for working mines or quarries on the cost-book principle.

Sect. 64. Nor to anonymous partnerships in Ireland, formed under 21 & 22 Geo. III.

Sect. 65 recites, that great injury has been caused by companies falsely pretending to be patronized or directed by eminent or opulent persons; and imposes a penalty of 10*l.* on any person who shall knowingly make such false pretence by any advertisement or otherwise.

Sect. 66. Judgments, &c., to be obtained against any company completely registered, may, if due diligence has first been used to obtain execution against the property of the company, be enforced against any shareholder for the time being, or any one who was a shareholder at the time the engagement was entered into, or before it was satisfied, or when the judgment was obtained. But no execution shall be issued against any former shareholder who has ceased to be such for three years.

Sect. 67. Shareholders, against whom execution has been so issued, shall be entitled to compensation from the company, or contribution from the other shareholders.

Sect. 68. Execution in the above-mentioned cases is to be applied for by motion in court, or summons before a judge, after ten days' notice shall have been given to the party sought to be charged.

Sect. 79. The registrar shall make an annual report to the Board of Trade,

setting forth—a list of companies provisionally registered in the past year, as also the companies completely registered, with the cases in which application has been made for the enforcement of penalties for not registering, and the proceedings thereupon, &c. &c.

The preceding analysis gives an outline of the prominent features of the clauses introduced in the Act, for the details of which we must refer to the parliamentary copy.

ABSTRACT OF THE JOINT-STOCK COMPANIES BILL,

PASSED FOR THE PURPOSE OF FACILITATING THE WINDING-UP OF COMPANIES UNABLE TO MEET THEIR ENGAGEMENTS, AND TO FACILITATE THE WINDING-UP AND DISSOLUTION OF JOINT-STOCK COMPANIES.

The preamble recites the passing, in the 7 & 8 Vict., of "*An Act for Facilitating the Winding-up of the Affairs of Joint-Stock Companies unable to meet their pecuniary Engagements,*" and an Act of 8 & 9 Vict., to serve the same purpose *in Ireland*, and an Act of 9 & 10 Vict., "*to Facilitate the Dissolution of certain Railway Companies,*" which enacted, *inter alia*, that a meeting of shareholders should have power to determine the dissolution of the company, and to decide whether or not such dissolution should be an act of bankruptcy, so as to wind up under the provisions of an Act thereinafter mentioned (such provision not to extend to railways to be made in *Scotland*), and that it should be lawful for any three of the committee therein defined, at any time after the dissolution, or for any commissioners to the amount requisite, to support a fiat in bankruptcy in *England* or *Ireland*, or a sequestration in *Scotland*, within three months after the resolution to dissolve, to petition for a fiat in bankruptcy, or a sequestration (if in *Scotland*) of the estates of the company; and that, upon the production of a copy of the *London Gazette*, containing the resolution to dissolve and to make such dissolution an act of bankruptcy, and upon the petition of any three of such committee, as such creditor or creditors as aforesaid, a fiat in bankruptcy should issue against the company by its registered style and name, and thereupon such company should be deemed within the provisions of the two first-recited Acts, as if a fiat had been issued before its dissolution, such provision not extending to *Scotland*. It also recites the expediency of the two first-mentioned Acts being amended, and further facilities given for the winding-up and dissolution of joint-stock companies.

Sect. 1 enacts that the Act shall apply to all companies, corporate or incorporate, within the provisions of the two first-mentioned Acts (including all companies which on 1st November, 1844, were registered under the Act of 7 & 8 Vict.), and to all companies which would have been within the provisions of the said two Acts, if they had not been dissolved or ceased to trade prior to the passing thereof, and to all banking companies specially exempted from the before-mentioned Registration Act of the 7 & 8 Vict., and to all companies which, under the Act for facilitating the dissolution of certain railway companies, should before March, 1848, be bankrupt, and to all companies, associations, and partnerships formed subsequent to this Act, the capital and profits whereof are divided into shares, transferable without the consent of all the co-partners.

Sect. 2 brings all mining companies within this Act.

Sect. 3 (the interpretation-clause) defines "company" to mean partnership, association, or company, corporate or incorporate. "Member," any person entitled to a share of the assets or profits at the time of the petition. "Constitution of a company," deed of partnership, settlement charter, Act of Parliament

regulations, or other instrument, including by-laws. "Contributory" to include every member and any person liable for debts, liabilities, or losses, either personally or representatively. "Call" to mean demand or requisition for contributory payment towards funds or assets, or in discharge of debts, liabilities, or losses. "Creditor," every person having an enforceable debt or demand or claim for damages. "Person" to include corporations. "Month" to mean calendar month. "The court," the English or Irish Courts of Chancery. "Master," the master in ordinary of the court, acting under this Act. "Fiat" to include commission of bankruptcy in Ireland; and "Court of Bankruptcy," any commissioner on such commission and the Irish Lord Chancellor sitting in bankruptcy. "Order absolute" to mean order absolute for the dissolution and winding up, or winding up only, of any company. All words importing the singular number to extend to the plural; all plural words to extend to the singular; and all words importing the masculine gender to extend to the feminine.

Sect. 4 makes it sufficient to cite this Act as "The Joint-Stock Companies' Winding-up Act, 1848."

Sect. 5 gives power to any one claiming to be a contributory to a company, summarily to petition the court for the dissolution and winding up, or the winding up, of such company in the following cases:—When the company shall have done, committed, or suffered an act of bankruptcy under any of the recited Acts. When a company shall have filed a declaration with the Lord Chancellor's secretary of bankrupts that the company is unable to meet its engagements. When judgment shall have been recovered against such company, or against any person authorized to be sued for it, or against a contributory or member acting or sued in the name or on behalf of the other contributories or members, and the plaintiff shall be actually in a position to sue out execution unrestrained, and there shall be no legal set-off, and that, within ten days after service of notice requiring immediate payment of such judgment debt, the company shall not pay, secure, or compound for the same. When any decree or order in equity shall have been pronounced, or order in bankruptcy or lunacy made against such company or person authorized to be sued for it, or member or contributor acting or sued as aforesaid, ordering the payment of money, and the same shall not have been duly complied with. When an action shall be brought against a contributory for a claim upon the company, and the company shall not, within ten days after proper notice in writing, have procured the action to be stayed, or indemnified the defendant. When any creditor to the amount requisite to support a fiat in bankruptcy shall have duly filed an affidavit of debt, and sued out a writ against the company or such persons as aforesaid, and shall have given notice, as in the case of a judgment debt, and the company shall not within three weeks have paid, secured, or compounded, or made it appear to a judge that they intend to defend the action upon its merits, and shall not, within three weeks, have caused an appearance to be entered. When any company shall have dissolved or ceased to carry on business, or shall be in the process of winding up; and when it shall be made to appear to the court that the company shall be dissolved.

Sect. 6 enacts that if any fiat under the revised Act shall have been issued, no such petition shall be presented by any other persons than the creditor assignees, who may, but only on the order and under the direction of the Court of Bankruptcy, petition the Court of Chancery to wind up the company under this Act, and that then the Court of Bankruptcy shall cause to be made on the proceedings under the fiat a memorandum of such order, and cause the proceedings to be deposited with the master, to whom the matter shall be referred, but the master may dispense with such production, and order the custody and production of the proceedings.

Sect. 7 enacts that any proceedings, accounts, and matters in any fiat before an order absolute under this Act shall be valid and conclusive for the purposes of this Act, and any pending proceedings, &c. may be concluded under this Act.

Sect. 8 enacts that any proceeding shall be sufficiently intituled "In the matter

of the Joint-Stock Companies' Winding-up Act, 1848," and in the matter of the company to which it relates, describing the company by its most usual style till an order absolute under this Act, and thereafter by the style used in such order.

Sect. 9 enacts that no order or other proceeding shall be impeached by reason of any of the petitioners being afterwards discovered not to be qualified, and provides that the court, on the petition of a properly qualified person, may order the former proceedings to be carried on by the petitioner.

Sect. 10 enacts that every petition under this Act for dissolution or winding up shall be advertised in the *London Gazette*, and served at the office of the company upon any member or servant of the company, or, in the absence of such persons, left at the office, or if no office can be found, to be served on any officer, member, or servant; and provides that petitions by direction of the Court of Bankruptcy, and any arrears thereon, need not be advertised; and also, that if no member, officer, servant, or office of the company can be found, the court may proceed on production of the *Gazette*, without proof of service.

Sect. 11 empowers the court to direct any petition to stand over for service or further service.

Sect. 12 enacts that the court may, on hearing a petition, require parties to show cause why the company should not be dissolved and wound up, or wound up, or make a conditional order, or refer it to the master for inquiry, and in default of cause shown, or on conditions being unfulfilled, or in case the master shall report that it is necessary or expedient, may make order absolute.

Sect. 13 empowers the court to direct the carrying out of any provisions in the constitution of the company, for dissolving or winding up, or for ascertaining the necessity or expediency of such steps.

Sect. 14 enacts that the court may dismiss any petition, with or without costs, or make an order, with or without special directions, and by such order the matter shall be referred to a master to wind up.

Sect. 15 enacts that every order previous to and including the order absolute be advertised in the *Gazette*, and served as the court shall direct.

Sect. 16 enacts that from the date of the order absolute, or from a date therein fixed, the company shall be absolutely dissolved.

Sect. 17 enacts that in default of a petitioner, having obtained an order absolute, carrying the order before the master within ten days, any person claiming to be a contributory may petition the court to have the prosecution of the order, and the court may direct thereon, and as to costs; such petition to be served upon the first petitioner, or his solicitor.

Sect. 18 empowers the court, in making any decree for the dissolution of a company in any suit, or after any such decree, to order the affairs to be wound up under this Act.

Sect. 19 enacts that after any order absolute, it shall not be lawful to deal with any of the assets of the company, except under direction of the master.

Sect. 20 enacts that when there shall be no official trustee, the master may appoint a receiver, who shall combine the powers of a receiver in a suit duly instituted and those of an official trustee, except as the master shall direct otherwise; such receiver to have power, under the written direction of the master, to apply the effects of the company in payment of judgment debts; the master to fix the security of the receiver, or to dispense with security; and provides that upon the appointment of an official trustee, the powers of the receiver shall cease, and he shall give up to the official assignee all moneys, &c., books, papers, &c., which shall have come to his hands, or be in his possession; and the master may make order to that effect; and also provides that all actions, &c, by or against such receiver shall be by the style of the official trustee of the company; and all such actions, &c., shall have the same effect as though an official trustee had been appointed, and a party to them, and shall not abate upon the appointment of an official trustee.

Sect. 21 enacts that under an order absolute, or upon the death, removal, or resignation of an official trustee, the master shall direct two advertisements to be inserted in the *Gazette* and two or more papers, giving notice that the master will, at a certain time and place, within fourteen days, proceed to appoint an official trustee or trustees, and if previously to making out a list of contributories to the company, all persons claiming to be contributories, and if after making out such list, all persons therein shall be entitled to attend, and propose or object to any appointment, and the master may then adjourn the appointment, without further advertisement.

Sect. 22 enacts that at the time and place fixed by advertisement or adjournment, the master shall, in writing, appoint an official trustee or trustees, either originally or in the stead of others; and the master shall have power, subject to any especial direction of the court, to remove such trustee or trustees, and appoint others; and such trustee may be a contributory of a company, or an assignee of a bankrupt company, or of any bankrupt member or contributory; and provides that if a majority in number and extent of interest of those upon the list of contributories of a company shall express in writing their desire for the removal of an official trustee, he shall be removed accordingly.

Sect. 23 enacts that on the appointment of an official trustee, the master may adopt the proposal of any of the parties attending him, and that the proposal of any parties who shall have appeared before the court shall not be entitled on that account to preference, and the master may act independently of any proposal, and appoint a person not proposed as official trustee.

Sect. 24 enacts that upon the appointment of the official trustee, or at a time fixed by the master, the trustee, with two or more approved sureties, shall enter into recognizances in the form set forth in the schedule or directed by the court, in such sum as the master shall direct (not to exceed by more than 1,000*l.* the sum the trustee is likely to have in his hands at any one time), for the duly accounting for all moneys, &c. which shall come to his hands; and on the death or bankruptcy of any surety, the master may require a new surety, and the master may from time to time require additional recognizances or new sureties, and upon the breach or non-fulfilment of any such recognizances, the master may direct the same to be put in force; and when a person shall have ceased to be an official trustee, passed his final account, and paid any balance due, the master may order the recognizances to be vacated.

Sect. 25 empowers the master, in case of default of official trustee, to order the trustee and his sureties, or any of them, their heirs, executors, and administrators, to pay, within a given time, to a person appointed by the master, the sum in which they are severally and respectively bound.

Sect. 26 provides and enacts that the master may accept the security of a guarantee society in lieu of such sureties as aforesaid.

Sect. 27 enacts that all appointments and removals shall be effectual without confirmation of the court, except otherwise ordered by the court, and all such appointments and removals shall be advertised.

Sect. 28 enacts that on the appointment of an official trustee the master shall order all books, &c., cash, &c., of a company to be, within a certain time, delivered to him, and provides, nevertheless, that the master may, from time to time, make such order as he thinks fit for the custody of such books, &c. (cash excepted).

Sect. 29 enacts that from the appointment of an official trustee all the estate, &c. of the company shall vest in him (except so far as the master shall in writing direct), and also all the powers of an official trustee; if more than one trustee, to be as joint tenants; and when any conveyance or assignment of property so vested would require to be registered, enrolled, or recorded, then the order absolute and the first appointment of official trustee shall be registered, enrolled, or recorded, and such shall have the like effect as the registering, &c. of any such assignment or conveyance would have had, and the title of any *bonâ fide* purchaser of such property or mortgagee, duly registered, &c. previous to such

registry as herein directed, shall not be invalidated by such order absolute or appointment; and provides that the court or the master may at any time rescind or vary any direction of the master, as to the non-vesting of the assets or claims of the company in the official trustee.

Sect. 30 enacts that after any order on petition by direction of the Court of Bankruptcy, all the estate, &c. vested in the assignees in bankruptcy shall, on the appointment of an official assignee, unless otherwise provided by the order absolute, become vested in him, together with all powers, &c.

Sect. 31 enacts that until the issuing of such general rules and orders as authorized by this Act to be made, the practice of the court as to receivers shall, subject to special rules and directions, apply to official trustees.

Sect. 32 enacts that the master may allow salary or remuneration, by way of per-centage, to the official trustee or receiver, and to vary the same from time to time.

Sect. 33 enacts that the official trustee may, with the approbation of the master, employ an attorney or solicitor.

Sect. 34 enacts that the official trustee shall, under the direction of the master, make up, continue, complete, and rectify the books of the company, and provide and keep such others as are necessary, with a private ledger for the separate accounts of contributories, and balance all the books and accounts, get in, sell, and convert the estate, &c., and wind up the business, and pay debts, and divide the surplus assets, and bring all questions necessary to be settled before the master, and the official trustee shall take and the master is authorized to give directions on such questions.

Sect. 35 enacts that the accounts of the trustee shall from time to time be passed before the master, the contributories having only liberty to surcharge and falsify such accounts.

Sect. 36 enacts that the official trustee shall make minutes of all proceedings and produce same before the master, whenever the master is required to proceed in the matter.

GENERAL COURSE OF PROCEEDING UNDER WINDING UP.—

Sect. 37 enacts that the master, upon any order absolute being brought before him, shall, immediately after directing insertion of the advertisements as to the appointment of the official trustee, and from time to time, determine what parties shall attend him in the proceedings, and he may alter or vary such determination; and in particular he may, with the consent in writing of the majority in number and extent of interest of the contributories, appoint and remove contributories to watch the liquidation as representatives of the contributories or such of them as in the opinion of the master ought to be represented; notices of proceeding to be served upon the parties appointed to attend and watch them, and expenses thereby incurred to be, except otherwise directed by the master, part of the general costs.

Sect. 38 enacts that all contributories may require, at their own expense, notices, as the master shall direct, of all or any proceedings, and shall be entitled to attend, by themselves, solicitor, or agent; and any contributory may submit any proposal relating to the affairs of the company.

Sect. 39 enacts that contributories being lunatics shall be sufficiently represented by their committees, and minors by their guardians; where no guardian exists, the father to be deemed such, and if no father, the mother; and provides that the master may appoint, when he thinks fit, a person to be the guardian of a minor, or the representative of a lunatic, for the purposes of this Act.

Sect. 40 enacts that every party who attends the proceedings shall signify whether he intends to attend personally or by solicitor, and, as the case may be, state the name and address of himself or solicitor, and notices of proceedings shall be sufficiently served accordingly.

Sect. 41 enacts that if proceedings under order absolute, not being such as

are to be taken by the official trustee, shall not be prosecuted by the person having the prosecution with due diligence, or if it shall appear desirable, the master may, on application of any contributory, commit to him the further prosecution thereof; and if any official trustee does not prosecute his proceedings with due diligence, any contributory may apply, and the master shall give such directions as he thinks necessary, or he may remove the trustee.

Sect. 42 enacts that after any order, the death of the petitioner or party shall not abate the proceeding, but the court may, and the master may, after order absolute being brought before him, upon application of a party interested, commit to such party the further prosecution of the proceeding, or the defence thereto, or to such other party interested as the master shall think proper; costs in such cases, unless otherwise directed, to be part of general costs.

Sect. 43 enacts that proceedings before the master shall be by proposal and counter proposal in writing, but provides that the master may direct parties to proceed by state of facts, when he deems it expedient.

Sect. 44 enacts that the master may dispense with warrants, or direct them to be taken out, and as to their prosecution, and fix their returns, without reference to any rule of practice, and proved *de die in diem*.

Sect. 45 enacts that the master may adjourn any proceedings, although by this act or otherwise directed to be taken at any time and place, and alter the place.

Sect. 46 enacts that the master may order at his discretion advertisements, service of orders, or proceedings, in such manner as he shall think fit.

Sect. 47 enacts that the master shall, at the request of any party interested, give certificates of any decisions, entries, or other matters.

Sect. 48 enacts that any contributory shall, subject to the control of the master, be entitled, without fee, to inspect the books of the company, or official trustee, or receiver, and take copies, abstracts, or extracts.

Sect. 49 enacts that, as between the contributories, the books, &c. of the company, until order absolute, and those of the trustee or receiver afterwards, shall be *primâ facie* evidence of the truth of their contents.

Sect. 50 enacts that after the appointment of an official trustee, all actions, suits, &c. in behalf of or against the company, shall be brought by or against the trustee by the style of "the official trustee" of the company, as described in the order absolute.

Sect. 51 enacts the same with regard to criminal proceedings *on behalf* of the company as sect 50 enacts with regard to civil proceedings.

Sect. 52. That in any pending action or suit against the company, the plaintiff may substitute the official trustee by the style aforesaid for the former defendant, by entering a suggestion on the roll in an action, or by obtaining an order in a suit.

Sect. 53 enacts that where actions are pending on behalf of the company, the official trustee may be substituted for the plaintiffs by the style aforesaid and in the manner aforesaid.

Sect. 54 enacts that the death, resignation, or removal of any official trustee shall not abate any action, suit, &c.

Sect. 55 enacts that the official trustee may, under the direction of the master, compound for or compromise any right of or demand against the company, and any action or suit, and submit to arbitration any dispute, and give effect to the award.

Sect. 56 enacts that all orders and decrees in equity against the official trustee shall have the same effect as if pronounced or made against the company; and the court may, on *ex parte* motion, direct the same to be enforced against the contributories to the extent of their liabilities after seven days' notice to the persons sought to be charged.

Sect. 57 enacts that all judgments against the official trustee shall have the same effect as if against the company.

Sect. 58 provides that nothing in the Act, except as therein provided, shall affect the rights of creditors or persons not being contributories, or the rights of creditors being contributories upon a distinct account, nor the rights of the company against contributories and others, nor any contracts entered into previous to the petition, nor any proceedings previously pending.

Sect. 59 enacts that no judgment, decree, or order shall take effect against the person or property of the official trustee, otherwise than as a contributory, and that the official trustee shall be indemnified against all losses, &c. not improperly sustained by him.

Sect. 60 enacts that no proceeding at law shall be taken or proceeded with by the official trustee without leave of the master, and the master may, in writing, direct proceedings to be stayed or discontinued; but the want of such leave is not to constitute a defence.

Sect. 61 enacts that no claim or demand of any contributory, or representative of a contributory, in respect of his share of the assets of the company, shall be a set-off to any demand against him of the official trustee on a distinct account; but if there shall be a balance against any contributory on his account with the company, the official trustee shall set it off against any demand of the contributory on a distinct account.

Sect. 62 enacts that the official trustee may, with leave in writing of the master, defend any action or suit against an individual contributor, but a judgment or decree shall have no other effect than if obtained against the original defendant.

Sect. 63 enacts that the master may summon any person to give evidence respecting the affairs of the company, and require him to produce, and if a contributory, leave any documents in his power, and may examine him *vivâ voce* or by interrogatory; and every such person not appearing or refusing to be sworn or examined, or not fully answering, or refusing to sign his examination or produce any document, may, upon certificate of the master, and upon motion after notice, be committed by the court to the Queen's prison.

Sect. 64 enacts that every witness summoned before the master shall be entitled to his legal charges; but the costs of a witness, being a contributory at the time of the order absolute, shall be in the discretion of the master. The master may suspend the payment of such charges, or order those of a contributory to be costs in the matter.

Sect. 65 enacts that if any person, being at the date of the order absolute a contributory, shall wilfully conceal or withhold any of the estate or effects of the company, and shall not, within 30 days after order absolute, discover the same to the official trustee, he shall forfeit £100 and double the value, to be recovered by action for the use of the company, and the certificate of the master shall be evidence of such wilful withholding or concealing.

Sect. 66 enacts that the master shall, upon the appointment of the official trustee, order any contributory, trustee, receiver, banker, or agent, to pay and deliver to the official trustee any money, books, papers, &c. in his hands, to which the company is *primâ facie* entitled; or in case of a contributory, shall appear to his debit upon the books of the company; but the master may, on application, discharge the order or prolong the time for payment.

Sect. 67 enacts that when any such order as mentioned in sect. 66 shall have been made and not obeyed, the same may be enforced by the official trustee upon affidavit of default, without making any demand.

Sect. 68 enacts that the conveyance of all real estate by the official trustee shall be by deed of grant, approved and certified by the master, such deed of grant to be effectual without any confirmation by the court; and that the signature of the official trustee to such deed shall be a discharge for money expressed to be received by him; but in the case of copyholds, &c., the deed of grant is to be entered upon the court rolls of the manor, and shall be effectual without surrender or admittance of the grantee

Sect. 69 enacts that where any of the assets of the company consist of government or other stocks, &c., not standing in the name of the company, the master may in writing appoint a person to transfer such assets into the name of "the official trustee;" the Bank of England and other companies being by this Act indemnified.

Sect. 70 enacts that all moneys got in by the official trustee shall be paid into the bank, to the account of "the official trustee," and be drawn out only by checks signed by him and countersigned by the master; but the official trustee may, under the direction of the master, retain money in his hands for current purposes.

Sect. 71 enacts that the official trustee shall make out a list of demands against the company, with observations thereon, to assist the master in forming a judgment thereon, and a list of debts allowed by the master or legally established, so as to represent the condition of the company's affairs; and shall enter all variations in such demands, and shall enter such lists in a book, to be inspected by the master.

Sect. 72 enacts that within ten days of the order absolute being brought before the master, he shall advertise the winding-up of the company in the *Gazette*, and require the creditors to come in and prove their debts.

Sect. 73 enacts that no creditor shall, without permission of the master, commence or proceed with any action against the official trustee or other person representing the company, or any contributory, until after exhibiting proof of his debt before the master, and any judge may order such action to be stayed till after such proof.

Sect. 74 enacts that debts shall be proved before the master in the same manner as in bankruptcy, unless the master shall direct otherwise.

Sect. 75 enacts that the master shall, upon proof exhibited, allow or disallow claims against the company.

Sect. 76 enacts that the official trustee shall make and keep a list of the contributories, and the extent of their respective interests.

Sect. 77 enacts that the master shall settle and certify such list after notice by public advertisement.

Sect. 78 enacts that notice shall be given to every person proposed to be included in, or specially excluded from such list.

Sect. 79 enacts that after the list shall be settled by the master, no person shall, without satisfactory cause shown, contest such list without leave of the court.

Sect. 80 enacts that no person not upon the list shall be entitled to appear as a contributory, but any person not specially excluded may claim to be inserted.

Sect. 81 enacts that any contributory whose name is on the list may summon any person before the master to show cause why his name should not be inserted in, or specially excluded from, the list.

Sect. 82 enacts that the official trustee shall apply the moneys got in under direction of the master in satisfaction of the debts of the company.

Sect. 83 enacts that the master may, before or after the assets of the company shall have been realized or exhausted, make calls upon the contributories for the purpose of settling the affairs of the company.

Sect. 84 enacts that the master shall apportion the calls among the contributories on the list.

Sect. 85 enacts that previously to a call being made, the master shall advertise his intention, so that the parties interested may attend.

Sect. 86 enacts that unless satisfactory cause to the contrary be shown, the master shall then make a peremptory order for the payment of such call at some period not sooner than three weeks.

Sect. 87 enacts that the peremptory order shall be advertised, and a copy served upon each contributory with a statement of his account, but such advertisement is not to be within ten days of the order, so as to give an opportunity for an appeal to the court.

Sect. 88 enacts that the official manager may, with approbation of the master, enforce any claim against a contributory of a company, or compound for, compromise, or abandon the same.

Sect. 89 enacts that in case of the executor or administrator of any contributor of a company not admitting assets, the master may direct proceedings to be taken.

Sect. 90 enacts that, so far as appears to the master consistent with the interests of the company, he shall cause the proceedings in and about the liquidation to be advertised and given notice of.

Sect. 91 enacts that the master may, when necessary, direct issues, special cases, and actions, to settle questions of law or fact between the company and its contributories and creditors; but no such issue, &c. is to be directed without the consent of the creditor concerned.

Sect. 92 enacts that the master shall subject to appeal, determine disputes between contributories, or the company and contributories.

Sect. 93 enacts that the orders, &c. of the master shall not require confirmation, except certain special reports.

Sect. 94 enacts that orders, &c. shall be filed, and produced in court when necessary.

Sect. 95 enacts that orders of the master shall have the same effect as orders of the court.

Sect. 96 enacts that the master shall have all the powers usual under the practice of the court, not at variance with the powers under the Act.

Sect. 97 enacts that in case of the absence or illness of the master, the master acting for him shall have all his powers.

Sect. 98 enacts that the master acting during vacations shall have the powers of the master to whom the matter stands referred.

Sect. 99 enacts the course and mode of appeals to the court against proceedings before the master.

Sect. 100 enacts that the master may, when he thinks fit, make a special report upon any matter, so that a motion may be made and the opinion of the court may be taken thereon.

Sect. 101 enacts that orders of the Master of the Rolls in England or Ireland, or the Vice-Chancellors in England, may be reheard before the Lord Chancellor of England or Ireland, on motion.

Sect. 102 gives power of appeal to the House of Lords.

Sect. 103 enacts that costs of winding-up shall be at the discretion of the master, and be paid as he may direct, either out of the assets of the company, or by contributories.

Sect. 104 enacts that the costs of all proceedings before the court shall be at the master's discretion.

Sect. 105 enacts that the master shall direct the ascertaining, taxing, settlement, and adjustment of costs.

Sect. 106 enacts that costs shall be recovered in the same manner as costs ordered to be paid by the court.

Sect. 107 gives power to the court to fix a table of fees.

Sect. 108 enacts that notices may be served by being sent through the post.

Sect. 109 enacts that in the case of any company whose place of business is in Ireland, or the winding up of which is in the Irish Chancery, the necessary advertisements shall be in the *Dublin Gazette*.

Sect. 110 enacts that copies of the *Gazette* containing advertisements shall be evidence, and that persons inserting advertisements without authority, or materially false, shall be guilty of misdemeanour.

Sect. 111 enacts that courts shall take judicial notice of the signature of the master, registrar, or other officer, and official seals attached to judicial or official documents under this Act.

Sect. 112 enacts that if any person shall forge the signature of the master,

registrar, or other officer, or an official seal, to any judicial or official document, or knowingly tender in evidence any such document with a false or counterfeit signature or seal, he shall be guilty of felony, and liable to punishment under the 8 & 9 Vict. c. 113.

Sect. 113 enacts that persons giving false evidence shall be guilty of perjury.

Sect. 114 enacts that any contributory destroying, altering, mutilating, or falsifying the books, &c. of a company, or being a party thereto, with intent to defraud contributories or creditors, or to defeat this Act, shall be guilty of misdemeanour, and liable to two years' imprisonment.

Sect. 115 provides for the enforcement of orders of the English Court of Chancery in Ireland, and *vice versâ*.

Sect. 116 provides for the enforcement of orders in Scotland.

Sect. 117 enacts that when the registered place of business or other office of a company shall be in England, proceedings shall be in the English Court of Chancery, and the like as to Ireland; but where the company shall have a registered place of business, or an office, or transact business, both in England and Ireland, petitions may be taken in either court.

Sect. 118 provides that in proceedings under this Act, the court shall have the same jurisdiction, &c. as in a suit duly instituted, and the general practice of the court shall obtain in such proceedings unless inconsistent with this Act.

Sect. 119 enacts that the court may stay proceedings on any order or report of the master.

Sect. 120 enacts that with respect to matters not provided for, the court may make general or special order.

Sect. 121 provides that, notwithstanding anything in the Act, the Lord Chancellor may appoint or direct the appointment of official managers, and determine their security, and fix and regulate their conduct and duties.

Sect. 122 enacts that the Lord Chancellor, with the advice and consent of the Master of the Rolls and one Vice-Chancellor, or two Vice-Chancellors, may make general rules and orders as to the mode of proceeding under this Act, although such rules repeal or vary the provisions as to procedure under this Act, or prescribe others; provided that they be laid before both houses of Parliament, if sitting, within a month; or, if not sitting, within a month from the commencement of the session.

Sect. 123 appoints district commissioners in bankruptcy and judges of county courts, masters extraordinary for the purposes of this Act, and empowers the Chancellor or the Master of the Rolls to refer matters under this Act to them, and to give them the same powers as the master would have under this Act, and subject to the same general rules, &c.

Sect. 124 enacts that the provisions as to the making of general orders before mentioned shall apply to Ireland as well as England.

Sect. 125 enacts that a petition under this Act shall be a *lis pendens* within the terms of 2 & 3 Vict. c. 11, if duly registered.

Sect. 126 legalizes the forms in the schedule annexed.

Sect. 127 enacts that the Act shall not apply to Scotland, except as specially provided.

Sect. 128 enacts that the Act may be amended or repealed during the session.

The Schedule annexed contains forms of the various proceedings under the Act.

MISCELLANEA.

Alleged Propulsion of a Vessel by Steam in the Year 1543.—T. Gonzales, Irector of the Royal Archives of Simancas in Spain, published in 1826 an account of an invention by Blasco de Garay, a naval captain, who, it is stated, exhibited in Spain, in 1543, an engine, by which ships of the largest size could be propelled in a calm without the aid of oars or sails. He made an experiment before commissioners, appointed for the purpose of examining his invention at Barcelona, on the 17th June, 1543, the vessel used being a ship of 200 tons. Garay, we are informed, wished to keep his mechanism a secret; but it was observed to consist partly of a large caldron or vessel of boiling water, and of two moveable wheels, one on each side of the ship. The experiment succeeded so far, that the vessel was propelled at the rate of two leagues in three hours; and the inventor was rewarded by receiving a sum of 200,000 maravedis, besides having his expenses defrayed from the public treasury. It is added, that the invention would have been further encouraged had not state expeditions of great consequence claimed the immediate attention of the emperor. But it is important to mention, that the authenticity of the entire history of Garay's invention, as published by Gonzales, has been called into question, and that no practical results of any utility followed.—*Frazer's Magazine.*

Mining Statistics of the Province of Carthagena, in Spain, for the Year 1847.—There were, in the course of the year, in active work, 173 mines, which employed 384 men; 245 horses and oxen were employed in the drawing of the water and carriage of the ores; the produce was 291,377 quintals of mineral, which was subdivided in the following proportions: 1,400 quintals of carbonate of copper, 289,977 of lead; of this latter there were 84,200 of galena, mixed with blende and pyrites of iron and copper, and 255,777 of carbonate of lead, in combination with different oxides of iron. There were 32 manufactories, which occupied 755 men and 90 horses, which produced 20,683 mcs. 5 oz. of silver, 119,008 quintals of lead, and 181 arrobas of refined copper. The consumption of fuel (in general Newcastle coke is used) was calculated at 200,000 quintals. The total number of furnaces was 59 calcining; 91 blast, of different dimensions and descriptions; 5 reverberatory; 14 cupolas—3 English, and 11 German. The intrinsic value of the produce obtained, which had to pay a duty to the government of 5 per cent., was 9,815,617 reals, equal to about 102,246*l.* sterling.

Mineral Produce of Austria.—The latest published government accounts give the following as the mineral produce of Austria:—Gold, 35 cwts.; silver, 547 cwts.; mercury, 166½ tons; iron, 148,379 tons; copper, 2,753 tons; lead, 6,666 tons; litharge, 1,299 tons; zinc, 227 tons; calamine, 908 tons; tin, 49 tons; antimony, 231 tons; cobalt, 182 tons; manganese, 6¾ tons; arsenic, 50 tons; plumbago, 1,827 tons; also, alum, 1,494 tons; sulphate of iron, 5,854 tons; sulphate of copper, 288 tons; sulphur, 1,259 tons; coal, 524 tons.

Joint-Stock Companies.—The total amount of fees paid at the office for the registration of joint-stock companies during the year 1847, appears to have been 4,155*l.*, including 548*l.* for the registration of returns, 769*l.* for the perusal of deeds of settlement and abstracts, 1,040*l.* for certificates of provisional registration, 84*l.* for renewed certificates to that effect, 141*l.* for annual certificates, 485*l.* for certificates of complete registration, 743*l.* on capital of companies completely registered, 80*l.* for searches, and 167*l.* for office copies. The number of companies provisionally registered in 1847 amounted to 215, the number completely registered to 98, and the number provisionally, but not completely

registered, to 178. The registration office employs a registrar, Mr. J. Whitmarsh, with a salary of 800*l.*, a deputy registrar, Mr. George Taylor, with one of 300*l.*, and five clerks with salaries of 80*l.* The number of bankruptcies of joint-stock companies which took place in 1847 amounted to four. Three were railway companies, and one a cemetery company. Of three of these associations the debts were not ascertained; of the fourth (the Birmingham and Boston Direct Railway Company), the debts amounted to 5,059*l.* 6*s.* 10*d.*, and the assets to 24*l.* 10*s.*

The Wicksteed Engine.—Mr. Wicksteed was the first to introduce the Cornish engine into the metropolis, and he deserves great credit for his exertions. The first engine was put up about ten years ago; the second, which is larger, is named the Wicksteed engine, and is erected at the East London Waterworks. It was started to supply water to that company's district in June, 1847, and is the largest engine hitherto erected in London; it was designed by Mr. Wicksteed, who is engineer to the company, and was erected under his superintendence. It was manufactured by Messrs. Sandys, Carne, and Vivian, of Copperhouse Foundry, Hayle, Cornwall. The diameter of the cylinder is 90 in., the diameter of the pump 44 in., length of stroke 11 ft., and it pumps 20 imperial barrels at each stroke. When working at the rate of eight strokes per minute, it raises 5,792 gallons per minute, or 8,340,480 gallons per diem, or 84,563,200 barrels per annum. The power when working at this speed is 200 horse-power. The main beam is 39 ft. long, and weighs 33 tons; it vibrates on a cast-iron main gudgeon, 16 in. diameter, and the whole is supported by four columns, and an entablature of cast iron, designed in the Grecian-Doric style. The plunger, with its appendages, weighs 48 tons, which mass of matter is raised 11 ft. high at each stroke of the engine. The pump-work is supported by two iron girders, weighing each 10 tons, and is strongly bolted down to a mass of masonry in the foundations. The boilers, four in number, are cylindrical, 34 ft. long, 6 ft. 6 in. diameter, with an internal fire-tube 4 ft. in diameter. The diameter of the steam-pipe is 16 in. The total weight of the engines, pumpwork, and boiler, is 414 tons, and the whole cost was 10,000*l.*, or 50*l.* per horse-power, or about 24*l.* per ton. The quantity of coal consumed by this engine, if working at full power night and day, would be 2,000 tons per annum, and the quantity of coals that would be consumed by the best of the ordinary non-expansive engines in doing the same work would be 4,500 tons; showing a saving in favour of the Cornish engine of 2,500 tons, which, at 13*s.* per ton, is 1,625*l.* per annum, or 16¼ per cent. upon the cost of the engine for coals only.—*Mining Journal.*

Steam-Power of France.—According to a late statistical report, made to the government, the number of locomotive engines constructed in France, and employed by the country in 1842, equalled the number imported from abroad; in 1843 there were two more French than foreign engines; in 1844, the surplus was 44; in 1845, 76; and in 1846, beyond which year the report did not go, this excess was 161. In 1846, there were 294 steamboats, belonging to private individuals and companies navigating the rivers and seas. The numbers and force of the engines in use on land, and acting as locomotives in the steamers, were, in 1846, as follows; viz. 4,395 engines at work on land, equalling 163,402 horse-power; 461 locomotives, of 60 horse power each, upon the average amounting to 27,600 horse-power; 338 engines used in steam-ships and boats, amounting to 108,513 horse-power. These, together, give a force of 299,515 horse-power. Comparing the strength of man to horse-power, it will be found that the steam-engines employed in France, in 1846, were substitutes for 2,097,625 men.

Extracting Pure Gold from Alloys and Ores.—The following method of obtaining pure metallic gold in the form of a spongy mass has been practised by me for several years, and no account of the process has, to my knowledge, here-

tofore been published. It is very useful to the chemist and to the manufacturer, and is more economical than any other method that I am acquainted with :—

After separating the gold from silver, by means of a mixture of nitric and hydrochloric acids, as is usually done, the solution containing gold and copper is to be evaporated to small bulk, and the excess of nitric acid is thus driven off. A little oxalic acid is added, and then a solution of carbonate of potash, sufficient to take up nearly all the gold in the state of aurite of potash, is gradually added. A large quantity of crystallized oxalic acid is now added, so as to be in great excess, and the whole is to be quickly boiled. All the gold is immediately precipitated in the form of a beautiful yellow sponge, which is absolutely pure metallic gold. All the copper is taken up by the excess of oxalic acid, and may be washed out. Boil the sponge in pure water so long as any trace of acidity remains, and the gold is then to be removed from the capsule, and dried on filtering-paper. It may be formed into rolls, bars, or thin sheets, by pressing it moderately in paper. I have made several useful applications of the gold sponge thus prepared, and had a tooth plugged with it in October, 1846, to which purpose it is well adapted. By moderate pressure the spongy gold becomes a solid mass, and burnishes quite brilliantly.

The jeweller or goldsmith will find spongy gold to be quite convenient when he requires it for a solder, and it is a convenient form of the metal for making an amalgam for fine gilding. I have used it for some years in soldering platina, and prefer it to the filings or gold foil for that purpose. This method of separating fine gold from coarse is very simple, and cheaper than the usual processes. It is applicable in the separation of gold from ores that may be treated by acids, and is vastly preferable to the method commonly used by chemists and assayers. When making oxide of gold for dentists' use, the chemist will find that oxalic acid, added to this potassic solution, will at once recover all the gold that is dissolved in an excess of the alkaline solution, much gold being lost by the usual method of preparing the oxide. Many other applications of this very simple method will occur to chemists and artisans.—C. T. Jackson: *Silliman's Journal.*

Amount of Lead shipped from the several points on the Upper Mississippi for the last seven years, and the estimated value :—

Years.	No. pigs, of 70 lbs. each.	Estimated value.
1841.....	463,414	981,842 90 dollars.
1842.....	474,699	787,592 08 „
1843.....	584,131, at 2 37½ dols...	971,117 78 „
1844.....	634,601, at 2 82½ „ ..	1,254,928 00 „
1845.....	788,460, at 3 00 „ ..	1,655,766 00 „
1846.....	752,493, at 2 90 „ ..	1,526,058 08 „
1847.....	787,656, at 3 00 „ ..	1,654,077 60 „
Total value produced in seven years ..		8,832,177 91 „
Or annual average of 1,261,739 70 dollars.		

The Royal School of Mines at Madrid.—This splendid and most useful institution, for the training of those who are about devoting themselves to mining operations, has received a grant from the government, for the purpose of extending its size, and also to establish a school of practical engineering, civil as well as mining, so that the pupils attending the lectures, or boarders in the college, may have every opportunity of becoming well acquainted with the different branches of these sciences. The School of Mines at Madrid has stood for many years pre-eminent among the institutions of Europe for the study of mining, as it is to Spain that Mexico, and, indeed, the whole of South America, from the time of the discovery of that vast and rich mineral continent of the New World by Christopher Columbus, down to the throwing off the yoke of the mother

country, is indebted for the extensive explorations, and working of the mines, which have rendered it so renowned in modern times, and in which, at present, so large a British capital is invested by the companies who continue the former works of the old Spaniards and primitive aborigines. The Spanish Crown having lost the whole of her rich possessions, with the exception of the island of Cuba, the Philippine Islands, &c., is now determined to turn to the utmost advantage its own local mineral resources; and to accomplish which, it not only gives great encouragement to adventurers, native and foreign, to embark in mining pursuits, but is also extending the opportunities for studying the science. The collection of minerals at Madrid is considered one of the finest in the world, and they are assorted with the utmost care by experienced mineralogists and travellers, who have collected specimens of every description of ores and minerals particular to each country which they have visited. The School of Mines of Paris, Vienna, Berlin, and even St. Petersburg, are making great additions; but that of Madrid will not be inferior to any, as the engineering department will contain a select model-room of the various improvements which have been made in England, in every description of machinery, but particularly those most applicable to mining operations, so that the pupils will have a full opportunity to study this branch of science.

The Cost-Book System in Germany.—All mines in Germany are worked on what in England is called the cost-book system; and this is not mere matter of choice, but is prescribed by the mining trade of Prussia. The registries, which are as exact for mining property as for land, recognise no firm. All must be entered to specific names, and all bills must be liquidated once a month. The purser, like the captain, is sworn to the state as well as to the proprietors, and is not removable, except on grounds in which the mining board concurs. Proprietors are bound to keep a mine at work on penalty of losing their right to it; but the extent of the workings is left to themselves, and one or two men preserve their claim as well as one hundred. We are enabled to give the cost of the working of the Eisenzeche Mine, from the accounts passed by the mining officer, and they will serve as a fair specimen of the charges attending working mines in the Siegen district. During the year 1846, when from 30 to 40 miners, and as many pickers, sorters, and overground hands were employed, the total cost of working out and making available 100 fms. on two lodes, with 40 fms. of cross-cutting, was—Miners, 3,308 dollars; sorters, &c., 1,061 dollars; cost of a winze, 647 dollars=5,016 dollars (or 758*l.*)

The returns were in iron, cobalt, and copper ore, and were stated at
500 tons, or 250 wagons of iron, at 5 dollars..... 1,250 dollars.
10,000 cwts. of cobalt ore and slate, averaging ½ per cent., at 100 dollars..... 5,000 „
6,250 „

As it was the first year of working, the cost of buildings which are erected by the miners, of tools, &c., which is included in the above estimate, has to be deducted. The profit is here clearly on the cobalt, to which the workings are proportioned, the washing-works not having in that year sufficed to work up more. But it is evident that there is scope enough for speculation in these parts, when the means of communication allow the ore to be taken off to distant markets.—*Banfield's Industry of the Rhine.*

Vicissitudes of Mining.—Humboldt relates of a Frenchman, Joseph Laborde, that he went to Mexico very poor, in 1748, and acquired a large fortune in a very short time, by the mine of La Canada. After building a church at Tasco, which cost him 84,000*l.*, he was reduced to the lowest poverty by the rapid decline of those very mines from which he had annually drawn from 130,000 to 190,000 lbs. weight of silver. With a sum of 20,000*l.*, raised by selling a sun

of solid gold from within the said church, which the archbishop allowed him to withdraw, he undertook to clear out an old mine, in doing which he lost the greater part of the produce of the golden sun, and then abandoned the work. With the small sum remaining, he once more ventured on another undertaking, which was for a short time highly productive, and he left behind him at his death a fortune of 120,000*l.*

On the Separation of Silver.—In a recent communication made to the Paris Academy of Sciences, MM. Malaguti and Durocher show that all the metallic sulphurets and arseniurets, properly so called, decompose a certain quantity of chloride of silver. This decomposition is effected more or less slowly when the contact is made with dry salts; but it is accomplished more rapidly, and in some cases even instantaneously, when the chloride or bromide of silver is in solution:

100 parts	sulphuret of	zinc	decompose	3	chloride of silver.
,,	,,	cadmium	,,	14	,,
,,	,,	bismuth	,,	2	,,
,,	,,	lead	,,	5	,,
,,	proto-sulphrt.	tin	,,	1½	,,
,,	bisulphuret	tin	,,	30	,,
,,	proto-sulphrt.	copper	,,	360	,,
,,	arseniuret	antimony	,,	120	,,
,,	,,	cobalt	,,	166	,,

All the pure metallic sulphurets possess the property of decomposing, under determinate conditions, a given quantity of chloride of silver, and even other insoluble chlorides. This property appears to be modified, in certain cases, by the molecular state of the substances. The decomposition of the chloride of silver may be effected by double decomposition, by reduction, or by reduction and double decomposition together.

Society for the Encouragement of the Arts, Manufactures, and Agriculture, in Paris.—The prizes offered stand out in striking contrast with those awarded by our own Society of Arts. The prizes to be given in 1849 are, to a considerable extent, for agricultural purposes—a great effort being at present made in France for its improvement; but it will be seen that others are awarded for scientific research and practical manipulation associated with metallurgy. Amongst others, a prize of 3,000 francs (120*l.*) will be awarded to the author of a communication indicating the most perfect method of constructing furnaces suitable for the oxidation of the metals. Another prize of 3,000 francs will be awarded to the competitor who shall point out the method of constructing the most perfect furnace for the casting of metals, or the reduction of metallic oxides. The society will also award medals of gold, platinum, silver, and bronze, to those manufacturers who shall send to the society the most complete accounts of the results obtained by the use of furnaces, of any particular construction, which they may have erected for their use; such communications to state the following:—*The Furnace*—its use and form; dimensions of the hearth; thickness of the walls. *Chimney*—its greatest opening; its smallest opening; its height; quantity of coal consumed per hour; ordinary product of the furnace per hour; quantity of oxygen remaining in the air taken at the bottom of the chimney; temperature of the smoke taken in the chimney.

With regard to the first of the prizes, the conditions are, for a furnace for the oxidation of the metals, to be constructed in such a manner as to throw on the fuel such a mass of air that the oxygen contained in it shall be sufficient for the complete combustion of the fuel, and for completely and readily oxidising the metal; these furnaces must be easily rendered capable of consuming their own smoke. The conditions of the second prize are, for a furnace for reducing the oxides, and casting, or remelting, metallic substances. The furnace must be erected of such suitable dimensions, that the air traversing the fuel may be so thoroughly decomposed that it shall not oxidise the metal which is to be cast, or simply remelted, on the hearth of the furnace.

The society having in view the experiments made in England by M. Napier, which tend to show that electricity, employed in that form, may operate in the production of useful decompositions in the extraction of metallic copper from the sulphate of that metal, and in the removal of certain injurious elements from cast-iron, &c., offers a prize of 6,000 francs (240*l.*) for the application of voltaic electricity to some useful branch of industrial art of the kind referred to, to be conducted on a well-tried and a manufacturing scale. The society leaves entirely to competitors the mode of application. These prizes will be awarded in the early part of 1849.

Mines in Australia.—The following is the total amount of sales of copper ore from the Burra Burra Mine, from the commencement, according to our Swansea ticketing-papers :—

Quarters ended Sept. 30, 1846	Tons 301	£4,955	19	6
„ Dec. 31, „	737	13,177	4	0
„ March 31, 1847	718	13,157	2	6
„ June 30, „	1,148	21,754	7	6
„ Sept. 30, „	1,495	31,530	12	6
„ Dec. 31, „	1,084	27,820	19	6
„ March 31, 1848	904	25,247	18	0
„ June 30, „	338	4,437	14	6
„ Sept. 30, „	1,686	31,491	14	0
„ Dec. 31, „	1,119	22,940	16	0
	Tons 9,525	£196,514	8	0

Consumption of Anthracite Coal in the United States, from its first introduction to the year 1846, inclusive :—

Years.	Tons.	Years.	Tons.	Years.	Tons.
1820	365	1829	112,082	1838	739,290
1821	1,073	1830	174,734	1839	819,327
1822	2,240	1831	176,820	1840	865,414
1823	5,523	1832	363,871	1841	812,244
1824	9,541	1833	437,648	1842	1,108,000
1825	34,893	1834	376,636	1843	1,268,852
1826	48,047	1835	560,658	1844	1,627,588
1827	63,484	1836	628,428	1845	2,012,742
1828	77,516	1837	681,476	1846	2,338,560

Origin of Metals according to the Opinion of Philosophers of the Seventeenth Century.—"The original production of GOLD and SILVER is thus; viz.—The four elements generate a seed, by the will of God and operation of Nature, and by their motion casts forth a semen into the centre of the earth, where it is digested, and by motion is sent abroad.

"Now, the centre of the earth is a certain empty place where nothing can rest, and the four elements send forth their qualities into the circumference of the centre; and the magnetic property of any place of the earth attracts something convenient to itself for the bringing forth of something. The seed being cast forth by the four elements from the centre of the earth into the superficies thereof, passeth through various places; and according to the nature of the place is anything produced; if it comes to a pure place of earth, a pure thing is made.

"The seed of all things is one, and yet it generates divers things. The seed, while it is in the centre, can as easily produce a tree as a metal, and an herb as a stone; and one more precious than another, according to the purity of the place. Therefore the seed of metals is not different from the seed of all things, being a humid vapour.

"The specification of this vapour into distinct metals is thus: This vapour

passeth, in its distillation through the earth, through places either *cold* or *hot*. If through *hot* and *pure*, where the fatness of sulphur sticks to the sides thereof, then that vapour mixeth and joineth itself unto that fatness, which afterwards it sublimeth with itself, and then it leaving the name of a vapour and unctuosity, and afterwards coming by sublimation into other places where the earth is subtile, pure, and humid, fills the pores thereof, and is joined to it, and so it becomes GOLD; and where it is *hot* and something *impure*, it becomes SILVER; but if that fatness come to *impure* places which are *cold*, it is made LEAD; and if that place be *pure*, and mixed with *sulphur*, it becomes COPPER; for by how much the more pure and warm the place is, so much the more excellent doth it make the metals."—*Webster's History of Metals: A New Touchstone. By W. B. Goldsmith. British Museum.*

First Discovery and Use of Metals.—Tin-mines of Cornwall.—Diodorus Siculus, who wrote forty years B.C., says that the produce of the tin-mines worked in Cornwall was conveyed to Gaul, and thence to different parts of Italy. Tin was used in the time of Moses, and is mentioned in the writings of Homer.

Lead is mentioned in the sacred writings, and is described by Homer as in common use at the period of the Trojan war. The ancients seem to have considered it as nearly allied to tin. The Romans employed it to sheath the bottoms of their ships, fastening it to the planks and timbers by nails made of bronze.

Copper is probably of greater antiquity than any other metal. It is mentioned in the Old Testament; and at a very early period domestic utensils and instruments of war were made of bronze, or a compound of copper and tin. During the Trojan war (Homer) the combatants had no other armour than that of bronze. The Greek and Roman sculptors are said to have executed fine works of art in porphyry, granite, and other hard substances, by means of copper instruments; whence historians have been led to believe that the ancients possessed the secret of rendering this metal as hard as steel.

Iron.—Moses speaks of furnaces of iron, and of the ores from which it was extracted, and tells us that swords, knives, axes, and instruments for cutting stones were in his time all made of this metal.

Coal was not generally adopted as fuel until the beginning of the reign of Charles I. It was, however, noticed in documents anterior to the reign of Henry III., for that monarch, in the year 1234, renewed a charter granted by his father to the inhabitants of Newcastle, by which they were permitted to dig coal upon payment of 100*l.* a-year. Coal had been introduced into London before 1306, for in that year the use of it as fuel was prohibited, from the supposed tendency of its smoke to corrupt the air. About the beginning of the 16th century, the best coal was sold in London at the rate of 4*s.* 1*d.* per chaldron, and at Newcastle for no more than 2*s.* 6*d.*

South Australia.—Shipment of Ores:—

	1846.	1847.
Burra Burra ..... Tons	4,564	6,357
Kapunda	1,386	1,332
Kanmantoo	289	336
Princess Royal	121	202
Montacute	503	100
Paringa	117	98
Glen Osmond (lead)	71	144
Total ..... Tons	7,051	8,589

In 1844, the importation of coal into Algeria produced a revenue of 954,173 fr.; and in 1845, of 1,024,391 fr.; of iron, cast-iron, and steel, 704,172 fr. in 1844; and 919,058 fr. in 1845. On cutlery the importation yielded 74,893 fr. in 1844; and 89,380 fr. in 1845.

Extraordinary Rope of Galvanised Iron Wire.—Mr. Andrew Smith, of the Wire-Rope Works, Mill-wall, Poplar, has just completed one of the most extraordinary ropes ever manufactured; the rope is for one of Mr. Treffry's planes, on his Par Railway (the highest in the kingdom). It is upwards of 567 fathoms (1,300 yards) in length, and weighs 4 tons 14 cwt. I We understand that it is composed of the best and longest wire ever yet prepared, and admirably adapted for the purposes for which it is intended—the wire being in one entire length.

Experiments with Galvanized Wire and Hemp Ropes.—Experiments have been tried in Woolwich Dockyard to ascertain the comparative strength of wire and hemp ropes. A wire rope, 3 inches round, and a hemp rope of 3 strands, hawser laid, common make, 7 inches round, were spliced together, and placed in the testing machine, and on the hydraulic power being applied the hemp rope broke in the middle on the strain reaching 11¾ tons, the wire rope remaining apparently as strong as when the experiment commenced. A wire rope, 3½ inches round, was then spliced with an 8-inch hemp shroud rope, and on the power being applied the hemp rope broke in the middle with a strain of 10½ tons, the wire rope continuing apparently uninjured.

Enormous Chain.—Probably the largest chain ever sent out of Stourbridge was that manufactured by Messrs. Bailey, chain manufacturers, and consigned to a firm in Liverpool. It was a link chain, and intended for the use of an incline; its length was 2,400 yards, or rather more than 1½rd mile, and its weight about 14 tons. It was removed to the wharf in a waggon drawn by eight horses.

A Steam-engine on a Railway thirty-six years ago.—Probably at the present time the following may not be uninteresting to many of our readers. In the year 1812 "an experiment was made with a machine at Leeds, for the purpose of substituting the agency of steam for the use of horses in the conveyance of coals on the iron railway, from the mines of J. C. Brandling, Esq., at Middleton, Leeds. This machine was, in fact, a steam-engine of 4-horse power, which, with the assistance of a crank turning a cog-wheel, and iron cogs placed on one side of the railway, was capable of moving, when lightly loaded, at the speed of 10 miles an hour." The experiment, which was witnessed by thousands, was crowned with complete success.—*West of England Conservative.*

New Fact in Telegraphing.—During the late rain, the Troy and Montreal line worked successfully from Troy to Burlington, a distance of 186 miles, with a battery of ten cups, in which spring-water was substituted for sulphuric acid, and the battery had been at work with the water for four or five days previous.—*New York Tribune.*

Antiquity of the Electric Telegraph.—In Arthur Young's Travels in France from 1787 to 1789, published at Bury St. Edmunds in 1792, we find the following passage, which clearly points out the discovery of the principle and the practice of the electric telegraph:—"In electricity he (Mons. Lomond) has made a remarkable discovery—you write two or three words on a paper, he takes it with him in a room, and turns a machine enclosed in a cylindrical case, at the top of which is an electrometer, a small fine pith ball; a wire connects with a similar cylinder and electrometer in a distant apartment, and his wife, by remarking the corresponding motions of the ball, writes down the words they indicate, from which it appears that he has formed an alphabet of motions. As the length of wire makes no difference in the effect, a correspondence might be carried on at any distance—within or without a besieged town, for instance, or for a purpose much more worthy and a thousand times more harmless, between two towns prohibited or prevented from any better connection."

Steam in 1736.—Jonathan Hulls, on the 21st December, 1736, the year in which Watt was born, took out a patent for "a new invented machine for carrying vessels or ships out of or into an harbour, port, or river, against wind and tide, or in a calm;" and in the following year he published a pamphlet detailing the nature of the invention, in which he makes the complaint alluded to in the text. Hull's pamphlet is very rare, but a copy is preserved in the library of the British Museum, and is well worth the attention of those curious in the history of steam progress.

Cochin-Chinese Canal.—In 1825 there was opened in Cochin-China a canal, 23 miles long, 80 feet wide, and 12 feet deep. It was begun and finished in six weeks, although carried through large forests and over extensive marshes; 20,000 men worked upon it day and night, and it is stated that 7,000 died of fatigue.

Extraordinary Blast.—Some blasting took place at the Catte Down Quarries under the following circumstances:—The hole was bored 20 feet with a 3-inch bit, and was blasted five times. The first four blasts consumed 200 lbs. of powder, and the fifth 320 lbs., the total quantity of powder used being 520 lbs. The stone raised in the quarry was estimated by the gaugers to be about 5,000 tons, in blocks chiefly from half a ton to 100 tons.

Explosions of Gas in Metallic Mines.—The explosions of gas, unfortunately so frequent in coal-mines, have not heretofore been mentioned, at least to my knowledge, in metalliferous deposits; I therefore publish a record of several accidents of this kind which have happened in the metallic mines of Alsace. One of these mines—that of Gundersbоffen (Lower Rhine)—was sunk upon a deposit of pisolithic iron ore; the bed of the ore, which is situated at the depth of 19 metres (62¾ yards) lies upon the marls of the upper lias. After several inflammations of the gas without serious consequences, one occurred in 1824 which severely burned several of the miners. At Winckel (Upper Rhine), in a deposit similar to the above, but resting upon the upper beds of the Jurassic limestone, an explosion took place in 1832, and another inflammation, much less violent, on the 27th June, 1846. Finally, the gas also took fire in March, 1846, in the veins of copper pyrites worked near Giromagny. From the circumstances mentioned in the notice which I have the honour to present to the Academy, it appears that the inflammable gas of these iron-mines is the proto-carburet of hydrogen, which, in the two first localities, emanated from certain bituminous beds of the lias and oolite, upon which the deposits of Gundarshoffen and Winckel rest, and rose through fissures in the works. At Giromagny, the gas probably came from the transition strata which enclose the vein.—*M. A. Dubree: Comptes Rendus de l'Acad. des Sci.*

Coal and Gold.—A curious fact is stated in the Philadelphia newspapers. From the annual report of the director of the United States Mint, it appears that the value of all the gold coined during the 24 years prior to 1848 was 12,741,653 dollars, or somewhat exceeding the average sum of half a million a year—a very considerable addition to the stock of American wealth; but it appears, from the returns of the coal trade in Pennsylvania, that the value of this commodity brought to market in this state is annually equal to the above large amount: that last year, for example, the value of her anthracite brought down to tidewater (nearly 3,000,000 tons) was actually equal to the value of all the gold produced in the south during the 24 years. From this it appears that the northern (Maryland as well as Pennsylvania) "coal" mines are more valuable "gold" mines than those of that metal in the south. —*Miner's Journal.*

Stannaries of Cornwall.—The Assessionable Manors' Commission Bill, which received the Royal Assent on the 31st of August last, contains clauses

with reference to the Stannaries' Courts of Cornwall, empowering claims for debts under 20*l.* to be tried by five jurors only, instead of twelve as heretofore. The Bill also enacts that one bailiff shall be appointed in each town in the county for common-law processes, and one bailiff in equity for the whole jurisdiction of the Stannaries, for taking possession of mines, serving of attachments, &c.

Letters Patent.—A parliamentary paper, lately published, shows that the total number of letters patent for inventions granted in the United Kingdom in 1847 amounted to 740, against 761 in 1846, and the total fees received thereon to 32,997*l.*, against 34,103*l.* in the preceding year. Of this sum 20,518 was paid over to the Consolidated Fund, and 9,830*l.* to the several offices entitled to receive the same.

Value of Mineral Property.—Mr. Cliffe says, "Mineral property on the hills, which, when the Monmouthshire Canal and its tramroads were constructed, was only worth 5*s.* an acre surface-rent, soon increased in value to 1,500*l.* an acre, or more, underground. The area of the Monmouthshire coal-field exceeds 89,000 acres, and the various seams of coal that can be profitably worked, are said to average about 50 feet, which produce a gross yield per acre of nearly 73,000 tons. The total quantity now worked annually is estimated at about 2,200,000 tons, at which rate there is a sufficient supply left for the next 1,500 years. The net quantity available for export has been estimated at about 3,000,000,000 tons. Great Britain now annually consumes from all her collieries about 21,000,000 tons."

The Crown Diamonds.—The following is the estimated value of diamonds in the crown worn by the queen on state occasions :—

Twenty diamonds round the circle, 1,500*l.* each	£30,000
Two large centre diamonds, 2,000*l.* each	.. 4,000
Fifty-four smaller diamonds, placed at the angle of the former ..	100
Four crosses, each composed of twenty-five diamonds ..	.. 12,000
Four large diamonds on the top of the crosses	.. 40,000
Twelve diamonds, contained in fleur-de-lis..	.. 10,000
Eighteen smaller diamonds, contained in the same ..	.. 2,000
Pearls, diamonds, &c., upon the arches and crosses ..	.. 10,000
Also one hundred and forty-one small diamonds	500
Twenty-six diamonds in the upper cross	.. 3,000
Two circles of pearls about the rim	.. 300
Cost of the stones in the Crown, exclusive of the metal	.. £111,900

Cast Iron.—A series of experiments were made by George Rennie, Esq., F.R.S., &c., on the changes of ordinary temperature, particularly on the rise of the arches on Southwark Bridge, having three rows of arches in length, containing about 5,560 tons of iron, from which it appears that the rise of an arch, whose span is 245 feet, and versed sine 23 feet 1 inch, is about $\frac{1}{10}$th of an inch for each degree of Fahrenheit, making $1\frac{3}{4}$ inch for a difference of 50°. In Mr. Rennie's opinion, there is no more danger to the stability of iron bridges from the effects of expansion and contraction than to those of stone, for the abutments being firmly fixed, the arches must necessarily rise or fall.

Consumption of Precious Metals at the Royal Mint.—The total value of the gold coined at the Royal Mint, from January 1, 1816, to December 31, 1847, was £90,029,736 15*s.* 3*d.* This enormous amount is thus made up :—There were coined, of double sovereigns, 16,119, weight 690 lbs., value £32,240 5*s.*; sovereigns, 81,711,149, weight, 1,748,767 lbs., value £81,711,160; half-sovereigns, 16,572,717, weight, 177,343 lbs., value,

£8,286,363. The total value of the silver coinage produced within the same period was £13,573,906 19*s.* 10*d.*: the number of pieces is thus stated:—Crowns, 2,319,561; half-crowns, 38,560,098; shillings, 119,508,840; sixpences, 76,017,875; groats, 16,574,200; fourpences, 88,209; threepences, 1,463,308; twopences, 1,010,018; pence, 271,920. The total value of the copper coinage was £243,051 4*s.*, viz., pence, 24,299,520: halfpence, 34,379,520; farthings, 66,296,832; half-farthings, 12,902,400. The largest gold coinage which took place since 1816 was in 1822, when the value amounted to £9,520,758 13*s.* 9*d.* and the smallest in 1818, the amount in that year being only to the extent of £3,574 9*s.* 3d. In the year 1839 there was not any new issue of gold coinage. The silver coinage has been carried on every year to a considerable extent, the average value coined being £400,000.

Gold and Silver Plate.—The total quantity of gold stamped in the Goldsmiths' Halls, in England and Scotland, in 1843, was 6,412 oz., and of silver, 911,044 oz. The duty derivable thereon amounted to £73,779 14*s.* 11d. The quantity stamped in 1844 was: gold, 7,236 oz.; silver, 1,027,050 oz.; and the amount received in duty, £83,182 5*s.* 9*d.* In 1845, there was a considerable increase, viz., gold, 8,040 oz.; silver, 1,160,433 oz.; duty received, £93,868 8*s.* 7*d.* In 1846, the returns show—gold stamped, 8,335 oz.; silver, 1,188,736 oz.; duty received, £96,243 0*s.* 2*d.* In 1847, there was a falling off in the quantity of metal stamped, the amount being: gold, 7,629 oz.; silver, 1,049,268 oz.; duty received, £85,182, 4*s.* 8d. The returns from the Goldsmiths' Hall, Dublin, show the following result:—1843, gold, 22 oz.; silver, 27,720 oz.; duty, £1,759 18*s.* 2d. 1844, gold, 69 oz.; silver, 33,179 oz.; duty, £2,134 11*s.* 3d. 1845, gold, 67 oz.; silver, 40,653 oz.; duty, £2,556 4*s.* 9*d.* 1846, gold, 77 oz.; silver, 34,665 oz.; duty, £2,047 2*s.* 3d.; and, in 1847, gold, 69 oz.; silver, 20,339 oz.; duty, £1,183 17*s.* 11*d.*

Speculation in 1825, 1835, *and* 1845.—The following is a digest of the amounts of capital proposed to be invested in home and foreign speculation at the periods specified:—

	Home Schemes.	Foreign.	Total.	Paid-up & depos.
1824 and 1825..	£156,778,630..	£48,189,000..	£204,967,630..	£35,014,698
1834 to 1837..	129,073,700..	21,175,000..	150,248,700..	22,616,070
1844 and 1845..	612,261,200..	79,250,000..	691,512,200..	78,448,420

Natural Phenomenon.—Great excitement has of late prevailed at Liegnitz, caused by another mysterious locomotion of the Wanderstein, or migrating stone, of the Riesengebirge. This stone has repeatedly been known to have changed its place, without the action of any outward agency whatever. It stands in the Agnetendell, near the village of that name, and consists of fine-grained granite of a yellowish gray, composed of white quartz, red felspar, with a slight admixture of black glimmer. This block of granite has suddenly moved above 25 yards from its former place. The last locomotion dates from the year 1822, and its migrations are the more enigmatical as they take place, not on a slope, but on perfect level ground. It is impossible to conceive the cause which thus repeatedly forces this rock from its place of rest, and constrains it to such violent leaps as that in 1822 and of this year, which took place between the 18th and 20th ult.—*Breslauer Zeitung.*

Chalk in the United States.—It is a generally received opinion, that there are no chalk formations in the States, all of that article used in the country being brought from England. A communication from J. Pickell to Prof. Silliman, however, controverts this opinion. The writer says, that being engaged under the direction of the Topographical Bureau, to deter-

mine the practicability of the construction or a ship canal across the Peninsula of Florida, it became necessary to sink several shafts. At the head of a small stream running into Black Creek, and near the Santa Fé river, an excavation was carried to the depth of 55 feet, a stratum of chalk was perforated, containing flint nodules of various sizes. The chalk was perfectly white, and, by a short exposure to the atmosphere, indurated to the hardness of the foreign article. The writer expresses the belief that this chalk formation continues through Georgia and the Carolinas, and perhaps to the coal region in Virginia.—*American Miners' Journal.*

Salt.—We are informed that a spring of brine has just been "tapped" by Mr. B. Smith, at Droitwich, Cheshire, at the depth of 217 feet, being a greater depth than any before discovered, the usual depth being 170 or 180 feet.

Common Salt.—The amount of common salt in all the oceans is estimated by Schafhæutl at 3,051,342 cubic geographical miles. This would be about five times more than the mass of the Alps, and only one-third less than that of the Himalaya. The sulphate of soda equals 633,644·36 cubic miles, or is equal to the mass of the Alps; the chloride of magnesium, 441,811·80 cubic miles; the lime salts, 109,339·44 cubic miles. The above supposes the mean depth to be but 300 meters, as estimated by Humboldt. Admitting, with Laplace, that the mean depth is 1,000 meters, which is more probable, the mass of marine salt will be more than double the mass of the Himalaya.

Artesian Well at Venice.—In an artesian well, sunk at Venice, for the purpose of supplying the city with fresh water, four beds of turf were traversed, at the respective depths of 97, 157·5, 279, and 412 feet. They show that, at four different epochs, the soil, which was gradually sinking, was covered to a slight depth by fresh water. Water was met with at the depths of 16, 131, 174, and 197 feet. This latter water, which rises about 10 feet above the level of the lagunes, appears to have its origin in the marshy plains which surround them; an origin which appears to be confirmed by the carburetted and sulphuretted hydrogen gases which escape from the water, and the large quantity of azotised matter which it contains —not sufficient, however, to render it unhealthy, or unfit for use.

How to Harden Gypsum.—It is known that calcined gypsum, after being moistened with a solution of alum and again burnt, acquires much greater hardness and solidity. M. Kreating recommends for the same purpose a solution of 1 lb. of borax in 9 lbs. of water, which is poured over the calcined fragments of gypsum. They are then kept at a strong red heat for six hours, ground to a powder, and worked. The effect is said to be still better if a pound of tartar and twice the quantity of water are added to the solution.—*Liebig's Annalen.*

Antiquity of the Arch.—Mr. Layard has discovered in the ruins of Nineveh positive proofs of use of the arch. One small chamber is perfectly vaulted with unburnt bricks, the diameter of the arch being 13 or 14 feet, and the form semicircular.

Extraordinary Slab of Native Copper.—We have had an opportunity of inspecting one of the largest masses of native copper which, we believe, has ever been produced, or, certainly, that has come under notice, in England. The slab to which we refer has been extracted from the Trenance Mine, situate four miles south-west of the Lizard Point, Mullion, in the county of Cornwall. The rock in which the lode is placed, from whence this "prill" has been obtained, is serpentine, very ponderous, and, we should imagine, containing metal, whether tin or other substance. The lode is

about 4 feet big, and at the point from whence the slab under notice was obtained, is about 14 fathoms in depth, and would appear to be the same run of ore as that obtained at about 6 fathoms nearer surface, and reported in our columns some twelve months since. The slab is about 7 feet 6 inches in length, and about 2 feet average in width, the extreme point being 2 feet 6 inches, while the thickness varies from 4 to 12 inches, or giving an average of 8 inches, forming part, as we are informed, of a slab, measuring at least 30 feet in length.—*Mining Journal.*

Noble Example to Employers.—At a dinner given to the workpeople of the Right Hon. Thomas Pemberton Leigh, at Hindley, near Wigan, the hon. gentleman, in drinking the healths of those present, concluded some very excellent remarks by the following praiseworthy declaration. The dinner was given, as is customary, previous to the departure of the hon. gentleman from the neighbourhood. He said—"There was one thing he would much like to see, and that was, men endeavouring to save something for a rainy day; and he was quite sure that, in many instances, it only required a beginning. In order to accomplish this, and to make a commencement, he would, on the Monday following, place to the credit of every one of his workmen, in the Wigan Savings' Bank, £2; and when he had done so, they would have perfect control over that sum. Further he should not interfere, as every man had a perfect right to do what he pleased with his own. They might draw it out and spend it, if they thought proper, for after he had given it to them it was their own, and he wished no further control over it. At the same time he would strongly advise them to save. He was, however, well aware how difficult a matter that was for a labouring man with a family. Still there were often small sums, 3d., 6d., or 1s., which he might put by if he had a fund to add it to, but which, otherwise, he would go and spend at the public-house. Any such sums, however small, Mr. Ellison, his agent, would receive and pay into the bank for them; and, by way of encouragement, every addition so made in the first twelve months he would double. If any one added 5*s.* he would add 10*s.*; if any one had added 10*s.* he would add £1; if any one of them had added £1 he would add £2; those, therefore, who had saved 20*s.* would have £5, with interest, to their credit at the bank, at the end of the year. He should be glad to find that they had done so. He would make no further inquiries, but at the proper time they would bring their books to his excellent agent, Mr. Ellison, who, he was sure, would carry out his wishes. It gave him great pleasure, he said, to see them all around him; and he concluded by drinking each of their good healths.

Earth's Early Inhabitants.—It is strange that, in a thin bed of fine clay, occurring between two masses of sandstone, we should thus have convincing but unexpected evidence preserved concerning some of the earth's inhabitants at this early period. The ripple-mark, the worm-track, the scratchings of a small crab on the sand, and even the impression of the raindrop, so distinct as to indicate the direction of the wind at the time of the shower; these, and the footprints of the bird and the reptile, are all stereotyped, and offer an evidence which no argument can gainsay, no prejudice resist, concerning the natural history of a very ancient period of the earth's history. But the waves that made that ripple-mark have long ceased to wash those shores; for ages has the surface then exposed been concealed under great thicknesses of strata; the worm and the crab have left no solid fragment to speak to their form or structure; the bird has left no bone that has yet been discovered; the fragments of the reptile are small, imperfect, and extremely rare. Still enough is known to determine the fact, and that fact is the more interesting and valuable from the very circumstances under which it is presented.—*Ansted's Picturesque Sketches of Creation.*

GLOSSARY OF TERMS.

USED IN THE MINING DISTRICTS OF DEVON, CORNWALL, DERBYSHIRE, STAFFORDSHIRE, NORTHUMBERLAND, DURHAM, ETC., WITH THOSE EMPLOYED IN THE FOREIGN MINES,

To which are added,

SMELTING TERMS, AND THOSE ASSOCIATED WITH THE SCIENCES OF GEOLOGY, MINERALOGY, AND METALLURGY.

CORNWALL AND DEVON.

Acicular—From acicula, a needle signifying long slender crystals.

Adit level.—A horizontal excavation, whereby the water from above that level, and drawn from the bottoms of the mine, is conveyed.

Adventurers.—Those who have shares in a mine. According to Pryce, in his *Mineralogia Cornubiensis*, *In*-adventurers are shareholders who attend to the working, and supply goods; *Out*-adventurers are those who pay their *quota* without attending to the management or benefit by supplying materials:*

Aggregated.—Where the component parts adhere, and may be easily separated, also when crystals are closely connected, they are said to be aggregated.

Air-machine.—An apparatus for forcing fresh air into, or withdrawing foul air from, badly-ventilated places.

Air-pipes.—Tubes or pipes of iron or wood for ventilating underground, or for the conveyance of fresh air into levels having but one communication with the atmosphere, and, consequently, no current of air existing.

Aitch-piece.—That part of a plunger lift in which the clacks are fixed.

Alliaceous.—The garlic odour of arsenical minerals when heated or struck.

Amorphous.—Without any determinate form.

Anhydrous.—Without water of crystalization.

Arch.—A piece of ground left unworked.

Arched.—The roads in a mine, built with stone or brick.

Argillaceous.—Consisisting of clay.

Arborescent or Dendritic.—Ramifying like a tree.

Arseniate.—The arsenic acid united with a base, as copper in the arseniate of copper.

Attle.—Rubbish, refuse of the mine, containing little or no ore.

Average produce.—The quantity of fine copper contained in the several parcels of ore raised from a mine, or sold at "ticketting."

Average standard.—The average standard, or rate, at which a parcel of ores, at ticketting or otherwise, is sold. See *Standard*.

Axis of a crystal.—The lateral planes surround its axis, which is an imaginary line passing down the middle of the prism from the centre of the upper to that of the lower terminal plane.

* This is not the case at the present moment, *In* and *Out*-adventurers being alike interested.

Back.—The back of a lode or that part nearest the surface from the point of working. That of a level is the part of the lode above.

Bal.—The miner's term for a mine.

Batch of ores.—Certain quantity of ore sent to the surface by any *pare* of men.

Bar of ground.—A vein of a different description of rock, crossing the lode or "country."

Base.—The substance to which an acid is united; the bottom or lower part.

Bearers.—Supports to the pumps in the engine-shaft.

Beat away.—To excavate, a term usually applied to hard ground.

Bed.—A seam, or horizontal vein of ore.

Bend.—Indurated clay; a name given by miners to any indurated argillaceous substance.

Bit.—The steeled end of a borer.

Black jack.—Blende.

Blende, also called Willd.—One of the ores of zinc, composed of iron, zinc, sulphur, silex, and water; on being scratched it emits a phosphoric light.

Black tin.—Tin ore previous to smelting, as obtained from the mine.

Blast holes.—The holes through which the water enters the "windbore," or bottom of a pump.

Block tin.—Metallic tin.

Blast.—The air introduced into a furnace.

Blasting.—Forcing off portions of rock by means of gunpowder. A hole is made with a borer, into which gunpowder is inserted, then tamped or confined, and ignited.

Blower.—A smelter.

Bounds.—The proprietary of tin ore over a given tract.

Bob.—The engine beam.

Bowlders.—Large stones or pebbles.

Botryoidal.—Globular forms, such as are found in copper, &c.

Borer.—A boring instrument, with a piece of steel at the end, called a boring bit.

Brace.—The platform placed *over* the mouth of a shaft, or winze, to which the tackle is fixed.

Branch.—A small vein which strikes out from the lode, and very generally again unites therewith.

Brood.—Impurities mixed with the ores.

Broil or Bryle.—The traces of the presence of a lode, found in the loose matter, at or near the surface.

Buckers.—Bruisers of the ore.

Bucket.—The piston of the lifting-pump.

Bucket-lift.—A set of iron pipes attached to a lifting-pump.

Bucket-rods.—Wood rods, to which the piston of the lifting-pump is attached.

Bucking-iron.—The iron or tool with which the ore is pulverised or broken down.

Bucking-plate.—An iron plate on which the ore is placed for being bucked.

Buddling.—Separating the ores from the earthy substance by means of an inclined hutch or cistern.

Bunch, or Squat of ore.—A quantity of ore of small extent; more than a stone, and not so much as a course.

Burden, or overburn.—The substances reposing on a bed of stream tin or surface covering the lode.

Burning-house.—The furnace in which tin ores are calcined to sublime the sulphur from pyrites; the latter being thus decomposed, are more readily removed by washing.

Burrow.—A heap of deads, attle, rubbish.

Button.—The result of an assay in fine copper.

Cage of a whim.—The barrel on which the rope is wound.

Cal.—Wolfram.

Cand or Kand.—Fluor.

Capel.—A stone composed of quartz, schorl, and hornblende, usually occurring on one or both walls of a lode, and more frequently accompanying tin than copper ores.

Captain.—One of the superintendents of the mine.

Captain dresser.—Superintendent of the dressing of the ores.

Capillary.—Long hair-like substances (viz., native silver) are so called.

Carrack.—See *Capel.*

Cases of Spar.—Veins of quartz (not containing ores) which have not a direction parallel to the lodes.

Casing.—A division of wood planks, separating the footway, in a whim, or engine-shaft, from one another, also dividing the shaft, so as to admit the pumps, and for drawing the ores or attle to surface.

Cathead.—A small capstan.

Caunter lode.—A lode which forms a considerable angle with the ordinary direction of the other lodes in its vicinity.

Cellular.—Composed of cells formed by the intersecting of the laminæ and lamellæ.

Champion lode.—The main or principle lode in a mine.

Charger.—An instrument in the form of the bit of a carpenter's auger, for charging holes for blasting, which are driven horizontally.

Chimming.—A process of similar effect to tossing, but being performed on small quantities of ore, the keeve is supported on the verge of its bottom.

Clack.—The valve of a pump of any description.

Clack door.—The aperture through which the clack of a pump is fixed and removed.

Claying.—Lining the hole (in which gunpowder is to be placed) with clay, to prevent the powder becoming damp.

Cob.—To break the ores with hammers in such a manner as to separate the dead or worthless parts.

Cockle.—Schorl.

Coffin.—Old workings open to the day.

Cost-Book.—The book employed in Cornish mines carried on upon the cost-book system. Mines so worked are in no way affected by the Joint Stock Companies' Registration Act, but are regulated by the laws of the Stannaries. The plan is to insert in the "cost-book" the name and address of each of the adventurers who first work the mine, with all subsequent transfers of shares, and every expense attached to the undertaking, which being entered in the cost-book, a meeting is held every two months, when the purser presents his accounts, made

up for that period, and the shareholders are thus enabled to judge of the profitable nature or otherwise of the undertaking, before incurring further liabilities; while any one feeling dissatisfied, may, on paying his proportion of the debts due, "sign his name off the cost-book," as it is termed, whereby he ceases to be liable for any future costs, and is entitled to his proportion of value of ores, machinery, &c. See article treating hereon, where the subject is treated on more fully.

Country.—The strata or rock through which the vein or lode traverses.

Course of ore.—A portion of the lode containing a regular vein of ore.

Cover.—The box into which the ore is removed, also the place at the head of the trunk, in which the slimes are by agitation mechanically suspended in water, in the process of trunking.

Crib, or Curb.—A circular frame of wood, screwed together, as a foundation for bucking or pulverising ore in a shaft.

Creases.—Divisions of buddled work.

Cross-course.—A lode or vein intersecting or crossing a lode at right angles, or any other direction, and which frequently throws the lode out of its regular course.

Cross-course spar.—Radiated quartz.

Cross-cut.—A level driven at right angles, to take or intersect the lode.

Crop.—The best ore.

Crushing.—Grinding the ores without water.

Cuneiform.—Wedge-shaped.

Cube.—A solid figure, contained under six equal squares.

Cupelo.—A small furnace.

Cut.—To intersect by driving, sinking, or rising.

Costeanning.—Discovering lodes by sinking pits on backs of lodes, or in their vicinity, and driving transversely to intersect them.

Chats.—Small heaps of ore.

Cofering.—Securing the shaft from the influx of water by ramming clay, &c.

Collar of a shaft.—The timber by which its upper parts are kept from falling together.

Collar.launder.—The pipe or gutter at the top of a lift of pumps through which the water is conveyed to the cistern.

Conchoidal relates only to fracture; compact minerals are more or less conchoidal.

Connection or Connecting rods.—The larger rods which are attached to the engine beam.

Core.—Miners usually work six hours at a time, and, consequently, four *pare* of men are required for the twenty-four hours—"forenoon core," from 6 A.M. to noon—"afternoon core," from noon to 6 P.M.—"first core by night," from 6 P.M. to midnight—and "last core by night," from midnight to 6 A.M.; occasionally the work is performed by eight hour cores.

Dam.—Choke damp, foul air.

Deads.—Attle or rubbish.

Dead-ground.—That portion of a lode in which there is no ore.

Deas.—The end of a level or cross-cut.

Decrepitate.—When a mineral exposed to heat flies with a crackling noise.

Dendritic.—See *Arborescent.*

Dialling.—Surveying underground or at surface for the purpose of laying down plans or sections.

Dileuing, or Terluing.—Washing ores supported on a hair-bottomed sieve in water.

Dippa.—A small pit.

Dish.—That portion of the produce of a mine which is paid to the landowner or lord, as rent or royalty usually ranging from $\frac{1}{13}$ to $\frac{1}{24}$.

Dissueing.—Is when the lode is small and rich, to break down the strata from one of its walls, by which means it can afterwards be taken away without being deteriorated, and without waste.

Disseminated.—Imbedded in the mass of another substance.

Dowsing-rod.—The hazel rod of divination, by which some pretend to discover lodes.

Dropper.—A branch when it leaves the main lode, or falls into the lod from the "country."

Draft-engine.—An engine used for pumping.

Drawing-engine or whim.—That employed for drawing ores or attle to surface.

Dredge or Dredging ore.—A stone impregnated, or traversed by minute veins or strings of ore.

Driving.—Digging or excavating horizontally.

Drift.—The excavation made for a road underground.

Dressers.—Cleaners of the ore.

Durns.—A frame of timber with boards placed behind it, to keep open the ground in shafts, levels, &c.

Dzhu, or Hulk.—To dig away a portion of the rock, &c., on one side of the lode or end, that the blast may be more efficient.

Elvan.—Porphyry, clay, stone, generally accompanying cross-courses.

End.—The further extent of a level or cross-cut.

Engineer.—The superintendent of the machinery.

Engine-man.—Man who attends to, and works the engine.

Engine-shaft.—The pit or shaft by which the water is drawn by the engine from the lower parts of the mine, to the adit or surface.

Efflorescence.—Minutely fibrous.

Fast.—The firm rock beneath the diluvium.

Fang.—A niche cut in the side of an adit, or shaft, to serve as an air course; sometimes a main of wood pipes is denominated a fanging.

Feeder.—A branch when it falls into the lode.

Flang.—A two-pointed pick.

Flat-rods.—Rods for communicating motion from the engine horizontally.

Floran tin.—Tin ore scarcely perceptible in the stone; tin ore stamped very small.—*(Pryce.)*

Flookan.—A soft clayey substance, which is generally found to accompany the cross-courses and slides, and occasionally the lodes themselves.

Fluke.—The head of the charger; an instrument used for cleansing the hole previously to blasting.

Footwall.—Is the wall under the lode; it is sometimes also called the underlaying wall.

Footway.—The ladders by which the workmen ascend and descend.

Forcepiece.—A piece of timber put in a level, shaft, &c., in a diagonal position, for keeping the ground open.

Fork.—"Water in fork," water all drawn out; the bottom of the engine-shaft.

Friable.—Easy crumbled or broken down.

Furnace.—The place in which the ore is placed for the purpose of smelting or reduction.

Gad.—A pointed wedge of a peculiar form, having its sides of a parabolic figure.

Geode.—A hollow ball.

Glist.—Mica.

Good-levels.—Levels driven nearly horizontal.

Gossan.—Oxide of iron and quartz generally found in the backs of lodes near to surface, or occurring at shallow depths.

Grass.—The surface.

Grain-tin.—Crystalline tin ore; metallic tin smelted with charcoal.

Grate.—Stamps grate; a metallic plate pierced with small holes; it is attached to the stamps, and through the holes the stamped ores escape.

Griddle, or Riddle.—A sieve.

Grinder.—Machinery for crushing the ores between iron cylinders or barrels.

Growan.—Decomposed granite; but sometimes applied to the solid rock.

Ground.—The country; the stratum in which the lode is found.

Gulph of ore.—A very large deposit of ore in a lode.

Gunnies.—Levels or workings.

Gurt.—A gutter; a channel for water.

Halvanner.—The dresser of, or operator on, the halvans.

Halvans.—The ores which are not sufficiently rich to be offered for sale until the impurities with which they are mixed is removed by dressing.

Hanging-wall.—The wall or side over the lode, in contra distinction to "footwall."

Hauling.—Drawing ore or attle out of the mine.

Head-sword.—The water running through the adit.

Heave.—The horizontal dislocation which occurs when one lode is intersected by another having a different direction. A right or left hand heave is when the part of the intersected lode on the opposite side of the traversing vein is found by turning either to the right or left.

Hook-handles.—The handles by which a windlass is worked.

Horse.—The dead ground between two branches of a lode, at the point of separation.

House of water.—A vugh or space, whether artificially excavated or not filled with water.

Horse-arm.—The part of a horse whim to which the horses are attached.

H Piece.—See *Aitch-piece.*

Hutch.—Cistern or box.

Irestone.—Hard clay-slate, hornblende, hornblende slate, hornstone.

Investing.—Coating or covering another mineral.

Jigger.—Cleaner of the ores.

Jigging.—Separating the ore with a griddle or wire-bottomed sieve, the heavier substance passing through to the bottom or lower part of the sieve; the lighter substances remaining on the upper part are put by for halvans.

Junction.—Applied to where veins unite.

Jumper.—A long borer, worked by one person.
Keeve.—A large vat.
Kibble.—A bucket usually made of iron, in which the ore, &c., is drawn to the surface.
Kibble filler.—Man who sends up work, &c., to the surface.
Killas.—Clay slate.
Lamellæ.—The thin plates of minerals.
Lander.—Man who attends at mouth of shaft to receive the kibble in which ores, rubbish, &c., are brought to the surface.
Lappior.—The dresser of the leavings.
Laths.—The boards which are put behind and supported by the "durns."
Launders.—Tubes or gutters for the conveyance of water; their form that of a long box, wanting the upper side and both ends.
Leader of the lode.—A branch or small vein; part of the main lode.
Learies.—Empty places; old workings or vughs.
Leat.—A watercourse.
Leavings.—The ores which are left after the "crop" is taken out.
Levels.—Galleries driven on the lode usually at ten, twenty, thirty, &c., fathoms below the adit level.
Lifters.—Wood beams, to which the iron heads of a stamping mill are fastened.
Lock piece.—A piece of timber used in supporting the workings.
Lode.—See *Vein.*—A regular vein producing or affording any kind of metal.
Loobe.—Slime containing ore.
Lost levels.—Levels which are not driven horizontally.
Machine whim.—A rotary steam-engine employed for winding.
Mallet.—An instrument used with the borer.
Material man.—One who delivers out and has care of the materials.
Meat earth.—The vegetable mould.
Mock lead.—Blende; sulphuret of zinc.
Moorstone.—Granite.
Mundic.—Iron pyrites.
Needle, or Nail.—A long taper piece of copper or iron with a copper point used when tamping the hole for blasting, to make, by its withdrawal, an aperture for the insertion of the rush or safety fuse or train.
Owner's account men.—Workmen paid at so much per day.
Pack.—To occasion the speedy subsidence of the ore in the process of tossing or chimming, by beating the keeve in which it is performed by a hammer.
Pair, or Pare.—Gang or party of men.
Parcel.—A heap of ore dressed and ready for sale.
Pass.—An opening left for letting down stuff to the level.
Peach.—Chlorite.
Pedn cairn.—A bunch of ore at a distance from the lode.
Pick.—An instrument of common use, as well in agriculture as in mining.
Picker, or Poker.—A hand chisel for dzhuing, which is held in one hand, and struck with a hammer.
Pillar.—A piece of ground left to support the roof or hanging wall.
Pitch.—Limits of the piece of ground set to tributers.
Pitch bag.—A bag covered with pitch, into which powder is put (previously to its being introduced into a damp hole) that it may be protected from moisture.

Pitman.—One employed to look after the lifts of pumps and the drainage.
Pitwork.—The pumps and other apparatus of the engine-shaft.
Plat.—Ground taken away in the mine to contain any ores or deads.
Plunger.—The piston or forcer of a forcing pump.
Plunger lift.—The set of pipes attached to a forcing pump.
Point of the horse.—The spot where the lode is split or divided into two or more branches.
Pol-vox.—Pronounced polrose; the pit underneath a water-wheel.
Pot-grown.—Soft decomposed granite.
Prian.—Soft white clay, esteemed a favourable sign when found in a lode.
Pril.—A solid piece of virgin metal, or the button from an assay.
Produce.—Fine copper contained in 100 parts of ore.
Purser.—The cashier or paymaster at the mines.
Quere.—A small cavity or fissure.
Rack.—An inclined frame on which the ores and slimes are washed and separated.
Racking—Is a process of separating small ore from the earthy particles by means of an inclined wood frame; the impurities being washed off, and the ore, remaining near the head of the rack taken from thence, undergoes tossing.
Ramose.—Branchiforms.
Reed, or Spire.—Gorse, or other tubular vegetable, into which gunpowder is put to convey a train from the snoff to the charge, the reed being put into the aperture made by the needle.
Refining.—Separating the ores.
Relief.—When one workman of the same pair changes core, or takes the place of another.
Riddle, or Griddle.—A sieve.
Rising.—Digging upwards.
Row.—Large stones, rough.
Rullers.—The persons who work the wheel barrows underground.
Run.—When excavations fall together.
Run of a lode.—Its direction.
Rush.—Used for the same purposes as the reed and spire.
Scal.—A shale or portion of earth, rock, &c., which separates and falls from the main body.
Scovan lode.—A lode having no gossan on its back or near the surface.
Scraper.—A piece of iron used to take out the pulverised matter which remains in the hole when bored, previously to blasting.
Seam.—A horse load.
Sett.—A mine or number of mines taken upon lease.
Set of timber.—A frame complete to support each side of the vein, level, or shaft.
Set off.—The part of a connecting rod to which the bucket rod is attached.
Shaft.—A sinking or pit either on the lode or through the country.
Shaking.—Washing the ores.
Shammel.—When ore or water is lifted part of the required height by one machine or person, and part by another.
Shears.—Two pieces of wood placed in a vertical position, or nearly so, on each side of shaft, and united at the top, over which by

means of a pulley passes the capstan rope. This is for the convenience of lifting out or lowering into the shaft, timber, or other things of great length and weight.

Shelf.—The firm rock.

Shieve.—The pulley over which the whim rope passes.

Shoding.—Tracing stones from the lower ground to the lode whence they were separated or torn by some convulsion of nature.

Shooting.—Shutting or blasting; fracturing and separating by the use of gunpowder.

Sinking.—Digging downwards.

Skimpings.—Skimmings of the light ores, &c., in the dressing process.

Slide.—A vein of clay which, intersecting a lode, occasions a vertical dislocation.

Slimes.—Mud containing metallic ores; mud or earthy particles mixed with the ore.

Smelting.—Reducing the ores by means of fire.

Snoff, or Match.—A substance, frequently brown paper, or other slowly combustible substance, which is ignited at one end, the other being in contact with the rush or train in blasting; the slow combustion is to permit the escape of the labourers.

Sollar.—A small platform at the end of a certain number of ladders.

Spalling.—The breaking up into small pieces, for the sake of easily separating the ore from the rock, after which it undergoes the process of cobbing.

Span beam.—The horizontal beam passing over the whim in which the upper pivot of the perpendicular axis moves.

Stamps.—Machinery for crushing the ores with the presence of water.

Stamp head.—The iron weight or head connected with the stamps.

Standard.—The regulation of the standard depends entirely on the price which fine copper bears in the market, rising and falling in the same proportion. Supposing the produce of a parcel of ore to be 10, and the price at which it was sold to the smelter to be 8*l.* 18s., the standard of that parcel will be thus obtained:—10 tons of the ore will be required to yield one ton of fine copper—therefore, 8*l.* 18s. × 10 = 89*l.* will be the value of the ore containing a ton of metal. The returning charge of 2*l.* 15s. must then be deducted, which in like manner multiplied by 10, gives 27*l.* 10s., this added to the former makes 116*l.* 10s., being the standard of that parcel. Low produce ore naturally brings a higher standard.

Stannary laws.—Regulations for the management, &c., of tinners, administered by equity judges resident in Cornwall and Devon.

Stem.—A day's work.

Stope.—*To stope*, to excavate horizontally, or beat away the backs.

Spar.—Quartz.

Spend.—To break ground; to work away.

Squat of ore—See *Bunch.*

Strake.—A launder, or box of wood without ends, in which the process of washing or tying is performed.

Strapping plates.—The iron plates by which the connection rods are fastened to each other.

Stream tin.—Tin ore found in the form of pebbles, in vales and streams.

Streamers.—The persons who work in search of stream tin.

String.—A small vein.

Stuff.—Attle or rubbish.

Stull.—Timber placed in the backs of levels, and covered with boards or small poles to support rubbish.

Sturt.—When a tributer takes a pitch at a high tribute, and cuts a course of ore, he sometimes gets from fifty to two or three hundred pounds in two months; this great wages is called a sturt.

Sump.—A pit; the bottom of the engine-shaft.

Sump-shaft.—The engine-shaft.

Sumpmen.—The pitman's assistants; men who attend to the machinery in the engine-shaft.

Takel or Tackle.—Windlass, rope, and kibble.

Tamping.—The material, usually soft stone, placed on the gunpowder in blasting, in order to confine its force, which would otherwise pass up the hole; also the process of placing the material.

Tamping iron or bar—Tool used for beating down the earthy substance on the charge used in blasting.

Team.—To lade water in bowls.

Thrown—either up or down—Is when a slide intersects a lode, the dislocation being shown by a transverse section—*Thrown up*, is when the undiscovered portion of the intersected lode is found to have been apparently lengthened—*Thrown down*, is the reverse.

Ticketings.—The weekly public sales of ores.

Timber man.—The man employed in placing supports of timber in the interior of the mine.

Tollar.—A person who periodically examines the limits of ground producing tin ore belonging to himself or (the lord) his employer.

Ton.—The ton varies in different districts; the common ton is 20 cwt. of 112lbs. or 2,240lbs. In Cornwall, the mining ton is 21 cwt. of 112lbs. or 2,352lbs.

Tossing, or Tozing.—A process consisting in suspending the ores by violent agitation in water, their subsidence being accelerated by packing—the lighter and worthless matter remains uppermost.

Trade.—Attle or rubbish.

Tram carriage.—The carriage (usually made of iron) used on a tramroad.

Tram-road.—Iron railroad way.

Treloobing.—See *Tossing.*

Tribute.—Proportion of the ore which the workman (tributer), has for his labour.

Tributers.—Men whose pay is a certain proportion of the ore or value of the ores they raise.

Tribute pitches.—The limited portions of a lode which are set to "a pair" of tributers, beyond which they are not for the time being permitted to work.

Tunnel head.—The top of a furnace, at which the materials are put in.

Turned house.—A term used when a level, in following branches of ore, is turned out of the original direction.

Trunk.—A long narrow cistern or pit, in which the ore and slimes which are mixed are separated by the subsidence of the former, and the washing off the impurities—the inclined box in which the ore and slimy impurities are separated in the process of trunking.

Trunking.—Process of extracting ores from the slimes—subsequently the ores undergo the processes of racking and tossing.
Tummals.—A great quantity; a heap.
Tut work.—Work in which the labourer earns in proportion to the amount of his labour; being paid for driving at a certain price per fathom.
Tuyere.—The aperture through which the air or blast is introduced into the furnace.
Tying.—Washing.
Underlayer.—A perpendicular shaft, sunk to cut the lode at any required depth.
Underlayshaft.—Shaft sunk on the course of the lode.
Van.—To wash and cleanse a small portion of ore on a shovel.
Vein.—See *Lode.*
Vugh, or Vogle.—A cavity.
Washing.—The ore undergoes occasionally two or three washings; the first process being that of washing the slimes and earthy particles from the rougher and larger stones of ore.
Water in fork.—When all the water is extracted.
Well.—The lower part of a furnace, into which the metal falls.
Wey.—A term used in South Wales, as applied to collieries, signifying ten tons.
Whim.—A machine worked by horse, steam, or water, for raising ores, &c.
Whim driver.—Man who attends to the horse in the whim.
Whim rope or Chain.—The rope or chain by which the kibble is attached to the winding engine or whim.
Whim shaft.—The shaft by which the stuff is drawn out of the mine by horse or steam whim.
Whip and derry.—A kibble drawn to the surface by a horse, the rope attaching one to the other simply passing over a pulley.
Willd.—See *Blende.*
Winch, or Winze.—Contraction of Windlass; the wheel and axle frequently used for drawing water, &c., in a kibble by a rope.
Windbore.—The lowest pump in which there are holes to admit water.
Winding engine.—One used to draw up ore, attle, &c.
Winze.—A sinking on the lode communicating one level with another, for proving the lode or for ventilating the drivings.
Work.—Ores before they are cleansed or dressed.
Working barrel.—The pump in which a piston works.
Working big.—Sufficiently large for a man to work in.
Zawn.—A cavern.
Zighyr.—When a small slow stream of water issues through a cranny it is said to zighyr or sigger.—(*Pryce.*)

DERBYSHIRE.

Adit.—A horizontal level taken up at the foot of a hill, and either driven on the lode or to intersect it, for unwatering or draining the mine at that level, and also occasionally used for bringing out the ores. The top adit is the adit first driven, deep adit the lowest adit driven, air adit is the adit driven purposely for ventilating the mine.

Arched.—The roads in a mine when built with stones or bricks are generally arched; level drifts and horse roads, either when cut in coal or in other strata, are formed arch fashion in the cutting for better security.

Bank, or Benk.—The face of the (coal) works or place where the miners are turning out the coal, sometimes called benk face.

Bar master.—An officer who superintends the lead-mines.

Bar mote.—A hall or court in which trials relative to lead-mines are held.

Bassit.—The outcrop of the strata, when a substance as coal appears at the surface it is said to bassit; also sometimes used to signify the upper end of the works, as the bassit or upper end.

Bearer, or Biard.—A large piece of timber to support the cistern and pumps in an engine-shaft.

Balland.—Dusty lead ore.

Belt.—A strap to which is attached a chain by which coal-miners draw the loaded corves of coal.

Bender.—A piece of iron attached to trunks, or barrels to which the pit rope is affixed.

Bind.—Indurate clay; a name given by miners to any indurate argillaceous substance.

Binghole.—A hole through which the ore is thrown.

Bingplace.—The place where the ore is laid ready for smelting and measuring.

Boring bit.—A piece of steel placed at the end of the borer.

Blast.—The air introduced into a furnace.

Blasting.—A hole made with a borer in which gunpowder is introduced, which being confined, and set fire to by a match, forces off a portion of the rock or lode—the process is called blasting.

Board, or Board gate.—An adit is driven board when it runs in a transverse direction to the grain or face of the coal.

Borer, Auger, or Drill.—A round piece of iron, the one end steeled.

Bow.—See *Bender*.

Bouse.—Lead ore as cut from the vein.

Breast.—The face of the (coal) workings.

Brettis (in coal-mines).—A quantity of wood packed together, and the interstices filled up with slack or rubbish.

Brettis way (ditto).—A way or road in the mine supported by brettises, built up on each side after the coal has been wrought out.

Bucker.—A flat piece of iron with a wooden handle used for breaking or crushing the ore by hand.

Bucklers, or Tacklers.—Small chains put round the coals, when loaded in corves, to prevent them from falling off.

Buddle.—A frame made of wood and filled with water, in which the lead ore is washed.

Budling.—Washing inferior ore lead to free it from extraneous matter.

Bule.—A piece of wrought iron to put round buckets or clack doors on large pumps, to hold them in their respective places.

Bunding.—Wood placed on which the refuse cuttings or deads are thrown.

Butty.—In collieries a person who contracts to raise coal by weight or measure.

Cank.—Whimstone.

Cap, or Lid.—A flat piece of wood placed between the top of the punch and the roof of the mine.

Cat dirt.—A substance also called toadstone, being sometimes clay, coal, and pyrites of iron; at others, a kind of earthy scoria not unlike lava.

Chair.—Used in drawing up ore or coal.

Chisel.—See *Drill.*

Churndrill.—A large drill from four to six feet long, commonly made with a chisel point at each end.

Cleet.—A wedge.

Clivis.—A hook with a spring to prevent its unfastening.

Coesteads.—A small building.

Cofer.—Cofering is beating a quantity of clay round the bricking in shaft to prevent the water coming through, and to hold it back in the strata.

Colliery bailiff.—Superintendent of the colliery.

Cope.—To agree to get lead ore at a fixed sum per dish or load, or other measure.

Coper.—One who agrees to get lead ore by bargain.

Corf.—A square frame of wood to load coals on; a kind of sledge used to carry ore from the miners at work to the shaft bottom.

Creep.—The weight of the incumbent strata after the coal has been partially worked out.

Crib, or Curb.—A circular frame of wood, either pinned or screwed together, to serve as a foundation for the bricking in a shaft.

Cross-cuts.—Lodes or levels driven in a diametrical direction, across the range of the vein.

Crow-bar.—A lever from six to eight feet long.

Cupelo.—A small furnace, worked by blast.

Curb.—See *Crib.*

Cutting.—An air course set up at either end of the work after the coal has been wrought out.

Crosses and holes.—When a person discovers a vein, and has no means to possess it for want of stowces, he marks the ground with crosses and holes, by which means he possesses it until he can procure stowces.

Dam.—Dams are made for various purposes underground, either for holding back water or noxious vapours, such as choke or fire damp. They are generally built either with sand or clay.

Dan.—A square frame of wood to draw coals from the work to the main roads underground.

Deads.—Cutting of stone of no use, attle or rubbish.

Deep level.—The watercourse leading to the engine-shaft, being always the deepest adit in the mine.

Dial.—A compass used to take bearings in mines.

Dialling.—Taking the different bearings of the various ways, gates, &c., in a mine; surveying.

Dish.—A measure containing fifteen pints Winchester measure.

Door in a mine—Is sometimes used to open and shut, to increase the circulation of air.

Dresser.—See *Loading pick.*

Drift.—The excavation made for a road underground.

Drill.—An instrument for boring shot and other holes.

Driving.—Cutting and blasting horizontally, applied to making a level or adit.

End.—An adit is said to be driven end when it is in a line with the grain of the coal.
Ending.—An adit driven in a direction with the grain of the coal.
Five.—The shaft or handle of a pick.
Face.—The face of the coal is at right angles with the grain.
Fang.—A niche cut in the side of an adit or shaft to serve as an air course; sometimes a main of wood pipes is denominated a fanging.
Fausted.—Refuse lead ore requiring to be dressed finer.
Fault.—An intersection of the strata.
Feigh.—The refuse washed from the lead ore.
Flat.—Flat work, &c., when a vein, &c., is horizontal.
Forks.—Pieces of wood used to keep the side up in soft places.
Foundermere.—The first thirty-two yards of ground worked.
Foundershaft.—The first shaft that is sunk.
Forefield.—The face or extent of the workings.
Forefield end.—The farthest extremity of the workings.
Freeing.—Entering a mine or vein in the barmaster's book.
Fuzze.—Straws or hollow briers, reeds, &c., filled with powder.
Gallery.—A drift or level.
Gate.—Road or way underground; it has various uses, either for air, water, or for bringing out the mine, coal, &c.
Gin.—The machine by which the coal or ore is raised from the mine.
Gobbing.—The rubbish remaining after the coal has been extracted.
Grove.—A mine.
Gingoni.—Walling up a shaft, instead of timbering, to keep the loose earth from falling.
Hade.—The underlay or inclination of the vein.
Hadings.—When some parts of the vein incline and others are perpendicular.
Hangbench.—Part of the stowces.
Hanging-side.—The wall or side over the vein, or to which it hangs.
Horn.—A line running horn is at an angle of 45 deg. with the face of the coal.
Jackhead-pit.—A well sunk inside the mine for various purposes.
Jackhead-pump.—The house water-pump of an engine is sometimes so called.
Jig-pin.—A pin used to stop the machine in drawing when necessary.
Judge.—A staff to measure underground work with—viz. the holing in coal-work.
Jumper.—A large borer, an iron instrument worked by hand, and steeled at each end like chisel bits.
Kevil.—A sparry substance found in the vein composed of calcareous spar, fluor, and barytes.
Kibble.—A bucket used for drawing up lead ore out of the mine.
Kit.—A wood vessel of any size.
Knits.—Small particles of lead ore.
Knockings.—Lead ore with spar as cut from the vein.
Knockstone.—A stone used to break the lead ore on, but sometimes it is a piece of cast-iron.
Leap.—The vein is said to leap when a substance intersects it, and it is found again a few feet from the perpendicular.
Leadings.—Small sparry veins in the rock.

Level.—An adit, gallery, or sough; generally the main watercourse in a mine.

Lid.—See *Cap.*

Limp.—An iron plate used to strike the refuse from the sieve, in washing lead ore.

Loading-pick.—A pick made purposely to cleave or rive up coals and prepare them for laying on the corves.

Loch.—A cavity in a vein.

Lot.—A certain proportion taken as dues for the lord of the manor, or owner of the mine.

Maul.—A large hammer.

Maundrill.—A pick for various purposes, but generally used to undermine.

Mear.—Thirty-two yards of ground on the vein.

Needle, or Pricker.—A thin rod of iron put in shot-holes, while they are rammed up, and which being then drawn out leaves a hole into which the match is introduced for setting fire to the charge.

Noger.—A jumper or borer; a drill.

Nogs.—Square pieces of wood which are piled on each other to support the roof of a coal-mine.

Noper.—See *Loading-pick.*

Old man.—Places worked centuries ago, or in former ages.

O'erlayer.—A piece of wood on which the sieve is placed after washing the ore in a vat.

Opens.—Large caverns.

Open cast.—When a vein is worked open from the *day* or surface.

Ore.—The mineral as produced in a mine.

Pack.—A quantity of materials, either wood or coals, &c., piled up to support the roof, or for other purposes.

Pee.—A piece of lead ore.

Pillar.—A support for the roof, of timber, stone, or other material.

Pipe.—A vein running unlike a rake, having a rock roof and sole.

Plumb.—A line and lead to measure with.

Poling.—A plank or piece of wood to prevent earth or stone from falling.

Possession.—When stowces or wooden frames are placed on a vein it is said to be in possession.

Post.—A pillar of coal or other strata left.

Pricker.—A thin piece of iron used to make a hole for the fuze or match to fire a blast.

Pringap.—A variable distance between two possessions.

Punch.—A piece of timber used as a support for the roof.

Rake.—An oblique vein.

Ratchell.—Loose stones.

Rib.—A pillar of coal left as a support for the roof.

Ricket.—See *Fang.*

Rider.—A rocky substance which divides the vein.

Ringer.—A crowbar.

Rising.—A man working above his head in the roof is said to be rising.

Roof.—The part above the miner's head; that part of the strata lying immediately upon the coal.

Rubble.—See *Ratchell.*

Run.—When the earth falls and fills up the shafts or works it is said to run.

Safety fuze.—An excellent invention, by Messrs. Bickford, Smith, and Davey, of Camborne, for the safe and certain blasting of rocks in mines and quarries.

Scaffold.—In a mine a platform made, where some miners work above the heads of others.

Scouring bit.—A bit attached to the end of boring-rods for the purpose of extracting the rubbish.

Scraper.—An instrument to extract the pulverized rock, &c., from shot-holes when boring.

Scrin.—A small vein.

Seat, or Sole —The floor or bottom of the mine.

Shaft.—A pit, the perpendicular entrance to the mine.

Shakes.—Fissures in the earth.

Shift.—The time a miner works for one day.

Shot.—Blasting.

Sinking.—Working deeper or downwards.

Skep, or Skip.—A square box (usually wrought iron) in which the coals are sent up to the pit's mouth.

Sled.—A sledge to draw ore without wheels.

Slipes.—Flat pieces of iron for the corves to slide on.

Slit.—A communication between two adits.

Smelting.—Reducing the ore to metal.

Smitham.—Small lead-ore dust.

Smut.—Decomposed dark earthy substance, or coal decomposed by the air at the surface of the earth.

Sole.—The seat or bottom of the mine, applied to horizontal veins or beds.

Sole tree.—A piece of wood belonging to stowces to draw ore up from themine.

Sough.—An adit or level for carrying off the water.

Spanner.—An instrument to turn screws with.

Spindle.—A part of the drawing stowces.

Stays.—Pieces of wood to secure the pumps in the engine-shaft.

Stemmer.—A piece of iron with which clay is rammed into the shot-holes to make them water-tight.

Stemples.—Wood placed to go up and down the mine instead of steps.

Stickings.—Narrow veins of ore.

Stope.—A piece of mineral ground to be worked.

Stoping.—Cutting mineral ground with a pick; working downwards.

Stopping.—A dam of bricks or clay to turn the course of the air.

Stowce.—Drawing stowce; a small windlass.

Strings.—Small veins of ore.

Stowces.—Pieces of wood of particular forms and constructions placed together, by which the possession of mines is marked; a pair of stowces possess a mear of ground.

Sump.—A shaft underground, a well or lodge for water.

Swallows.—Caverns or openings where the water loses itself.

Tacklers.—Small chains to put round the loaded corves.

Thurl.—A long adit in a coal-pit.

Thurst.—The ruin of the incumbent strata after the pillars and stalls are wrought out.

Troughs.—Wooden drains like troughs.
Troubles.—Faults or interruptions in the stratum.
Trunks.—Wooden spouts to convey wind or water; small boxes in which rubbish or dirt is sent up out of the mine.
Tub.—A cast-iron cylinder put in the shaft instead of bricking, for the purpose of beating out the water and making it rise to a level.
Tugs.—Hoops of iron fastened on the corves to which the tacklers are affixed.
Turntree.—A part of the drawing stowces or windlass.
Underlay.—When a vein hides or inclines from a perpendicular line it is said to underlay.
Vein.—Any substance different from the rock; a rake vein is oblique; a pipe vein nearly horizontal.
Vat.—A wooden tub used to wash ore and mineral substances in.
Wash-hole.—Where the refuse is thrown.
Walling.—When the roads in the mine are made with stone it is called walling. The side of the mine or gangart is frequently called the wall.
Wastes.—Vacant places left in the gobbing, on each side of which the rubbish is packed up for the better support of the roof.
Water-holes.—Places where the water stands.
Weigh-board.—Clay intersecting the vein.
Wedge.—An iron tool to get ore, split rocks, &c.
Whim.—An engine or machine to draw ore, &c., worked by horses.
Wind-way.—A passage left purposely for air.
Wind-bore.—The bottom pipe in a lift of pumps.
Wind-holes.—Shafts or sumps sunk to convey wind or air.
Windlass.—A machine used to draw up ore, &c.—See *Stowce*, by which name it is commonly called.
Windless.—A place in a mine where the air is bad or short, is said to be windless or airless.
Yokings.—Pieces of wood ascertaining possession; stowces.

SOUTH STAFFORDSHIRE.

Air-head.—A channel 2 feet 3 inches by 3 feet 6 inches, driven on a level with the top of the gate-road, and about 4 yards on one side of such gate-road.
Bildas, or buildhouse.—The men going down at 6 and working till 9, and sometimes 10 o'clock, is termed a bildas, for which the men get nothing but a drop of beer. This was originally denominated *buildhouse*, from the fact of the butty being able to *build* so many *houses* from the exactions thus made upon the poor men.
Boring apparatus.—Consisting of triangles, springing-pole, rods, punches, shell, &c.
Blowing-tools.—A small set of blasting instruments.
Breakes.—Fissures, or cracks, that are found in working near old works, arising from the consolidation of such old workings.
Back-horse.—The horse that draws the loading skip from the loaders to the waggon-hole.
Bolt-hole.—A passage same size as gate-road, but leading from the gate-road into a side of work, in which the dams are generally placed.
Bandsman.—A man who loads up the coal.

Bankman.—A man who lands the skip at surface.
Bow.—A piece of wrought iron passing from one side to the other of a skip, by which it is let down into the mine.
Bating.—Lowering the gate-road, or other passage.
Benching-up.—Holing above the measure, and then breaking up the lower part.
Bowke.—A small wooden box, used for drawing clay and ironstone, and for sinking.
Butty.—A getter of coals, or ironstone, by contract by the ton.
Curb.—A circular piece of wood, pinned together as a foundation for the bricking of a shaft.
Crop.—The line of inclination of a mine.
Calcining.—Roasting iron ore.
Charter master.—See *Butty.*
Cutting.—The coal being cut perpendicularly round the pillars and ribs, in order to let the coals fall.
Cog.—A small square building of rough stones, or coals, left to support the roof during the operation of holing.
Crowbar.—Wrought-iron levers of various lengths, for rifting out the large coals.
Capstan and Rope.—Winding apparatus, with levers and strong rope, used when repairing pumps, trees, &c.
Cleansing.—Clearing and making fit for traversing old gate-roads; carrying out slack from the holers; clearing the sumps at bottom of shafts, to admit of water-room, &c.
Cropping-out.—When the seam crops out at surface.
Doggy.—An underground superintendent, employed by the butty.
Downfall.—A downthrow.
Dialling.—Surveying the different ramifications of the mines by means of the magnetic needle.
Dresser.—A large pick, used for preparing the large coals for loading into the skips.
Driving.—Cutting and blasting horizontally, applied to making a level, or air-way, &c.
Dip.—The line of depression of a mine.
Dan.—A small waggon, used in ironstone-mines.
Damp.—Carbonic acid gas.
Dog-hook.—A long hook, by which the empty skip is drawn in any direction.
Damp Sheet.—A large coarse sheet, placed across the gate-road, to force air in another direction.
Doors.—Stoppings for air in main gate-road.
Draught.—The quantity of coals raised to bank in a given time.
Drink-time.—Meal-time.
Drum.—That part of the winding machinery on which the rope or chain is coiled.
Drop—Applies to a quantity of coal caused to drop by cutting—sometimes the thickness of 3 feet, and at others of 6 feet.
Druggon.—A square wrought-iron or wooden box, used for lowering clear water into the mine for the horses, and for conveying water into the interior of the mine, &c.
Dams.—Stoppings of fine sand and brickwork, of various thicknesses, in

the gate-roads, to exclude the atmospheric air from old workings, to prevent spontaneous combustion.

Engine-pit.—The pumping-shaft.

Elve.—The handle of a pick.

Fault.—A dislocation, with rock, or other foreign matter, lying between.

Fire-stink—Arises from the decomposition of iron pyrites, which is so abundant; hence the necessity of ribs, dams, &c.

Fast-end.—The part of a face that juts against the solid.

Foot-hook.—The large hook that is hooked to the bow of a skip, or tacklers, in drawing coals up the shaft.

Foot-hook chain.—A strong chain at the end of the rope, and connected with the foot-hook.

Face.—In ironstone-mines, the work in progress.

Fleaing—Is practised when a gate-road, or other work, is about to be abandoned, as a system of robbing, as it is termed in the north, or an endeavour to thin the ribs to the greatest extent.

Fighting—Applies to the ventilation when reversed—as the upcast becoming the downcast, and *vice versâ*.

Ground Bailiff.—A superintendent, visiting the mines about once a week; has the entire direction, and should be made answerable for all accidents from breakages, bad ventilation, &c.

Gin.—A wooden drum, with vertical shaft, cross-piece, beam, &c., by means of which shallow mines are realized.

Gate-road.—A passage driven on the floor of the coals about 10 feet wide, and 10 feet high, used to carry the coals along.

Gob.—The refuse that is left behind when the work is completed, as small coal, earthy matter, inferior ironstone, &c.

Gob-road.—A road that passes through that part of the mine which has been previously worked.

Garland.—A trough, or gutter, round the inside of the shaft, to catch the water running down the sides.

Holing.—The lower part of the coal being taken away, 2 feet 3 inches in height, honourably, in order to bring down the overlying mass.

Hanger-on.—The man who hangs the skip on at the bottom of the shaft.

Horse-fettler.—The man whose whole duty it is to provide for and attend to the horses underground.

Hanging—Applies to that part of the seam which remains—as when the bottom coal is taken away, the top coal is hanging.

Hammer.—Large 8 or 10lb. hammers, used for driving the wedges in breaking up large coals for loading.

Horns.—Guides for the rope on the drum.

Hand-gears.—Small winding hand-barrel, used for preliminary sinking, or to realize very shallow mines.

Holing-shovel.—A short-handled, round-bladed shovel.

Hovel.—An erection at surface, near the pit's mouth, for the convenience of the banksman.

Jackey-pit.—A small shaft sunk inside the mine, for various purposes.

Jig-chain.—A chain hooked to the back of a skip, and running round a post, to prevent its too rapid descent on an inclined plain.

Knocking-up.—The banksman beating (rather peculiarly) the runner at surface, to inform the miners below that it is time to come up.

Knob.—A small support for the roof.

Lazyback.—The place at surface where the coals are loaded and stacked for sale.

Lid.—A piece of wood placed between the top of a prop of timber and the roof of the mine.

Level.—A water-passage underground.

Log, or Baby.—A balance weight, placed near the end of the pit-rope, to prevent its running back over the pulley.

Landing.—The banksman receiving the loaded skip at surface.

Ladder.—Strong wood ladders, 10 to 20 feet long, to enable the collier to affix his scaffolding, when cutting the top coals in.

Lever.—Strong oak levers, 15 feet long, used to lift loaded skips on to the rails, in case of their getting off, or accident, &c.

Lamp.—The safety-lamps of Davy, Clanny, Stephenson, and Upton and Roberts. The majority are made by local ironmongers.

Launder.—A large wrought-iron or wooden spout, into which the water-barrel is lowered, and which conveys the water to a culvert, or other outlet, near the pit's mouth.

Mobby.—A leathern girdle with small chain and hook, used by lads in drawing the ironstone from low places, on small bowkes.

Mine Surveyor.—A person who dials the workings of a colliery as often as requisite, and makes plans of the mines got and ungot.

Machine.—The weighing apparatus used to weigh the coals at surface.

Man-o'-war.—A small pillar left in some critical situation in a side of work.

Navvy.—That part of the face of an ironstone-mine lying between two roads.

Net.—A strong cord net by which the large and powerful horses are let into the collieries.

Openings.—Those parts of the side of a work that are between the pillars and between the pillars and ribs.

Open Work.—A coal quarry.

Pricker and Puller.—A long sharp-pointed instrument (not unlike a boatman's shaft), used to break out the spurns left in cutting the coals.

Pillar.—A square piece of coal, 9 yards square, left to support the roof, but which in completing the side of work is often robbed—viz., parts cut away.

Parting.—A small joint in the coal-measure; and when one road leads out of another, that is a parting also.

Pikeman.—A man who holes or cuts the coal.

Pit-frame.—The framework carrying the pit pulley.

Pit-eye-pillar.—A solid piece of coal, left round the bottom of shafts for their protection.

Ring.—A circular piece of wrought-iron, about 8 inches deep, used to place on the skip of coals, to increase the load.

Rise.—An upthrow.

Royalty.—The dues payable to the real owner of the colliery.

Rib.—A barrier of coal, left between each successive side of work, to prevent either water or obnoxious vapours, arising from such old workings, spreading over the whole pit.

Runner.—Landing-waggon for the skip at surface.

Roofing.—When the top of the loaded skip wedges against the top of the gate-road.

Rake.—A strong iron rake, for loading up into iron baskets the small coals.

Runner—Applies when any part of the winding-machinery breaks, and allows the loading skip or miners to descend the shaft with the greatest velocity.

Rate.—The sides of the gate-road, or other works, falling off and obstructing the passage.

Rodney.—A roughly-constructed platform, with old rails, near the pit's mouth, upon which a large fire is made during the winter nights, to light the bank.

Stint.—A given quantity of work to be performed.

Side-bassett.—A transverse direction, or at right angles with the line of dip.

Sleepers—Are of wood or cast and wrought iron, according to their different purposes.

Setting.—Timber setting, or props, in various lengths.

Sump.—Water-room at the bottom of a shaft.

Sump-planks.—Strong balks of timber bolted together, forming a temporary bottom, or scaffolding, for the shaft.

Side-laning.—Making the gate-road (when abandoned for that purpose) into an opening 10 yards wide—viz., making the gate-road part of the new side of work.

Snatch.—A small chimney at surface, about 6 or 8 feet high, connected with an air-furnace and trumpeting, used to ventilate very limited underground workings by the means of one shaft, but much disused now.

Stall.—An opening made between pillars in the direction that the work is progressing, and the transverse openings—also termed *openings*.

Straight-stall.—An excavation made into the thick coal, having the solid coal left on three sides of it.

Scaffold.—Planking elevated by stays and ladders, in order to allow the miner to ascend and disengage the coal in the upper part of the seam.

Shaft.—A pit from 5 to 8 feet diameter, the smaller used for ironstone and the larger for coal mines.

Shift.—The extent of time taken for any particular operation.

Slipes.—The sledges at the bottom of the skip, used to draw the coals upon from the work in progress to the railroad.

Smut, or Mucks.—Bad soft coal, containing much earthy matter, found in the immediate locality of faults.

Stays.—Pieces of wood to secure the pump-trees in the engine-pit.

Stamp.—A mark cut in the roof or sides of the mine, as a point of reference, to show the amount of work done.

Spurns.—Small ties or connections, left between the coals hanging and the ribs and pillars, to insure safety to the miner during the operation of cutting.

Sulphur.—Carburetted hydrogen gas.

Stage.—A particular distance that a horse travels along the gate-road, and where candles are regularly placed.

Shot.—Blasting.

Skip.—A sledge-shaped waggon with a wrought-iron bow, used to draw the coals up the shaft.

Straw.—A fine straw filled with powder, used as a fuse.

Stone.—Ironstone.

Side of Work.—An excavation in the 10-yard coal, varying in extent, composed of a series of 10-yard square openings, and 9-yard square pillars, according to the nature of the overlying strata.

Spout.—A channel same size as air-head, and about 4 yards long, driven from the air-head into the gate-road at about every 15 yards, so as to always keep the communication as forward as possible.

Sumping.—A small square shaft, generally made in the air-headings, when crossing faults, &c., or made to prove the thickness of coal, &c.

Shet.—The roof of the coal-mine when broken down.

Trade.—Demand for coal.

Trumpeting.—A small channel cut behind the brickwork of the shaft.

Throwing—Is generally done in the night, by breaking out the small spurns left at certain distances during the cutting, and so entirely disengage the hanging coal from the ribs and pillars—having nothing left then but its own cohesion.

Tipe.—To upset, or overthrow a skip.

Turn-out.—A short loop line of railway, made in order to allow one skip to pass the other in the gate-road.

Tie.—A support for the roof attached to the rib, forming the shape of the letter.

Trow.—A wooden spout, made in various lengths, and from 4 inches to 2 feet square, used for carrying air, &c.

Tacklers.—Four pieces of chain, terminating at one end with a hook, and at the other in a ring, used to tackle up the skip with when drawing it up to the shaft.

Thurl.—To make a breach into former workings or gate-roads.

Tubbing.—Cast-iron cylinders, in pieces, bolted together and placed in the shaft, to enable the sinkers to penetrate quicksand, water, &c. in safety.

Ventilating-flue.—Trumpeting, commonly called, but to which a new name has been recently given.

Ventilating-stack.—A stack 90 feet high, with partition, and large air-furnaces, and connected with the ventilating-flue—not much used at present.

Waggon-hole.—That part of the railroad ending in the side of work.

Wedge.—Used to break up large coals, rock, &c.

Whimsey.—An engine used to draw up coals; applied more to the old atmospheric engines.

Way-end.—Applied in ironstone-mines to that part of the face where the road enters.

Wind-way.—An air-way leading from one road to another.

Water-barrel.—A large wrought-iron barrel, with a self-acting valve in the bottom, used in drawing water, where there are no pumps.

Waggon.—A square platform, with four wheels placed under, for the purpose of conveying the skip of coals from the workmen to the bottom of the shaft.

Yard-stick.—A three-feet measure, to determine the extent of holing done, &c.

NEWCASTLE-ON-TYNE.

Air-boxes.—Tubes of wood used for ventilation where there is only one passage or opening.
Air-crossing.—An arch built over a horseway or other road, with a passage, or air-way above it.
Arrage.—A sharp point or corner.
Back.—A slippery division in the coal-seam, extending from the thill to the roof.
Back-end.—The part of a judd left after the sump is brought down.
Back-skin.—A covering of leather worn by men working in pumping pits, or other wet places.
Backing-deals.—Deals placed behind cribs to keep back loose strata.
Bank.—The surface, or top of the pit.
Bankman.—The man who lands the coals at the top of the pit.
Bargain.—A piece of work to be done at a certain price.
Bargain-men.—Men who work by the bargain.
Barrier.—A strong pillar of coal left between two collieries, or between two districts of workings.
Barrow-way.—An old term for tramway, originating from the time when the coals were brought out from the workings in barrows.
Barrowmen.—See *Putters.*
Basset.—The outcrop of the coal.
Battery.—An embankment.
Bend away.—A signal given to raise up.
Beater.—An instrument for beating stemming on a charge of powder.
Bed.—The foundation of a wall or cribbing.
Blower.—An excessive discharge of gas generally from a fissure.
Bord.—A passage driven across the fibres, or grain of the coal.
Borehole.—A hole bored through strata to prove their quality.
Bore-rods.—Rods used in boring.
Bord-room.—The width across an old bord.
Bratties.—A wood partition, used for ventilation, when there is only one opening or passage.
Brasses.—Lumps of sulphate of iron found in coal.
Brakeman.—The man in charge of the winding engine.
Broken.—A part of the mine where the pillars are in course of removal.
Boll.—A measure containing 9,676 cubic inches.
Bucket.—The piston of a lifting set of pumps.
Buntons.—Strong balks of timber.
Balks.—Where the roof is not level, but comes down into the coal.
Caller.—A man who calls the men when time to go to work.
Calling course.—The time when the men go to work.
Cage.—The shaft-carriage.
Canch.—A protuberance, or certain thickness of stone to be worked opencast.
Chaldron.—53 cwt. The waggons which convey the coals from the pit to the place of shipment carry the above quantity, and are called chaldron waggons.
Chock.—A piece of wood for stopping waggons on the top of a bank.
Chock and Block.—Tightly filled up.
Chisel.—The cutting part of a drill.

Clam.—A support or bracket.
Claggy.—Adhesive.
Claggy top.—When the coal adheres to the roof.
Clack.—A valve in the pumps.
Cod.—The bearing of an axle.
Coursing the air.—Ventilating the workings of the mine.
Corf.—A basket for carrying coals.
Corf bow.—The handle of the corf.
Corver.—The man who makes and repairs the corves.
Crampet.—A bracket.
Creep.—A heaving-up of the floor of the mine, occasioned by the weight of the superincumbent strata.
Crosscut.—A passage driven at an angle with the fibres of the coal.
Crab.—A capstan, for raising or lowering of pumps, &c., in a pumping-pit.
Consideration.—Money paid to the hewers for bad coal, or for any extra trouble.
Cow.—A piece of wood or iron placed behind the crab or gin-start, to prevent it from revolving back.
Coal-pipes.—Very thin irregular layers of coal.
Cradle.—A suspended scaffold used in shafts.
Collarings.—Pieces of wood or iron for securing the pumps in the shaft.
Crib.—A circular piece of wood wedged tight in a shaft, to make a foundation for walling or tubbing when the strata are loose.
Cowp.—To overturn—when the men exchange working-places they are said to "cowp."
Dant.—Soft inferior coal.
Dayhole.—An adit or level from the surface.
Daywater.—Water which penetrates into the mine through some direct opening to the surface.
Davy lamp.—The safety-lamp invented by Sir H. Davy.
Davy man.—The man who trims and repairs the Davy lamps.
Deputy overman.—The man who lays the plates and sets the timber for the hewers, and has charge of a district of the mine.
Dip.—A downward inclination.
Downcast-pit.—The pit down which the air passes.
Double working.—When more than one man is put to work in any one working place.
Double-handed gear.—Heavy drilling-tools which require two men to use them.
Dogs.—Pieces of wood at the bottom of an air-door—the part of the chain which is fastened to the rope.
Drill.—An instrument for perforating a hole in the strata, into which a charge of powder is laid.
Drilling-hammer.—A hammer used for drilling holes.
Drop.—Machinery used in shipping the coals by which the coal-waggons are lowered on to the ship's deck.
Dyke.—A dislocation of the strata.
Erles.—Earnest-money.
Enginewright.—The man who repairs the engines and machinery.
Face.—The extremity of the workings.
Falls.—Bucket or clack falls—the part which opens and shuts to allow the passage of water.

Fast shot.—When a charge of powder is exploded without having the desired effect.
Feeder.—A stream or spring.
Filleting.—Wood stringing.
Fitter.—The person who sells the coals at the shipping port.
Fitting-office.—The office for transacting business at the shipping port.
Fittage.—Expenses incurred in selling the coals.
Flat.—The termination of the horseway, the coals being brought thereto by the putters.
Flap-door.—A manhole-door.
Flange.—A projection at the top and bottom of pumps when they are bolted together.
Flange bolts.—Bolts for fastening pumps together.
Foal.—A young boy employed in putting coals.
Foul.—When the air of the mine is explosive.
Foulness.—The sulphuretted hydrogen gas of the mine.
Fother.—One-third of a chaldron.
Frame-dam.—A strong separation of wood and clay to stop water back.
Furnace.—A large fire at the bottom of the upcast pit, to rarefy the ascending column of air.
Furnace-man.—The man who looks after the furnace.
Furtherance.—Extra price paid to the hewers, when required to put the coals.
Gait.—A journey, or trip.
Gangway.—A wooden bridge.
Gavelock.—A lever used in working stone.
Gear.—Working-tools.
Gears.—The trapping of a horse.
Girdle.—A thin stratum of stone.
Gin.—A horse-machine, for raising men and materials up the pit.
Glut.—A piece of wood to fill up behind cribbing or tubbing.
Goafe.—A part of the mine from which all the coal has been worked.
Gullet.—An opening or fissure in the strata.
Hack.—A large pick, used in working stone.
Half-marrow.—Young boys, of whom it requires two to do the work of one putter.
Headsman.—A putter.
Headtree.—A piece of wood, on the top of a prop, to support the roof.
Helper-up.—A boy who assists the putters, when they have to bring the coals up a dip or bank.
Headway.—A passage, driven in the direction of the fibres of the coal.
Hewer.—A man who cuts or works the coal.
Hewing.—Working the coal.
Heap.—The accumulation of stones, rubbish, &c. at the top of a pit.
Heapkeeper.—A man who overlooks the cleaning of the coals on the surface.
Hitch.—A small dislocation of the strata, which does not exceed the height of the coal-seam.
Hoggers.—Stockings without feet, worn by the men when at work.
Hogger-pump.—The uppermost pump in a sinking-pit.
Horseback.—A portion of the roof or floor which obtrudes into the coal.
Inbye—Inbyeside.—Further into the mine.

"Into the house."—The upstroke of a pumping-engine.
Judd.—In whole-working, is a portion of the coal excavated ready to be brought down.—In pillar-working, is a portion of a pillar of coal in the course of removal.
Jenkin.—A lift, or passage driven in a pillar of coals.
Jack head staple.—A small pit in which the feed set for the boilers is generally placed.
Jack head set.—The set of pumps in the jack head staple.
Jack-roll.—A windlass worked by hand.
Jackanapes.—Small rollers between the rope-rolls and pulleys on which the rope runs.
Kavels.—Lots cast by the men at stated periods for the different working-places.
Kirving.—The holing made in the bottom of the coal by the hewer.
Keel.—A large river-boat for carrying coals—8 chaldrons.
Keeker.—An overlooker.
Kibble.—A small rubbish-tub.
Laid out.—When a corf or tub contains an excess of small coal or stones, it is forfeited, or laid out, by the hewer.
Landry-box.—A box at the top of a set of pumps into which the water is delivered.
Landsale.—Coals sold to the country in the neighbourhood of the pit.
Levels.—Gutters for the water to run in.
Limmers.—The shafts by which the horses draw.
Lining.—Dialling, or surveying underground.
Lowe.—A light—"piece of lowe"—part of a candle.
Machine.—The winding-engine.
Marrow.—A partner.
Main engine.—The pumping-engine.
Maul.—A large hammer.
Metal stone.—Argillaceous stone.
Metal rig.—The strata forced up by a creep.
Meetings.—The middle of a pit or inclined plane.
Mistress.—A lantern used by the drivers in the main airways.
Mothergate.—The bord along which the coals are trammed from a district of workings.
Mudds.—Small nails.
Nicking.—The holing made by the hewer in the side of the coal.
Nickings.—The small coal worked in forming the nicking.
Off-take-joint.—The joint by which the bucket is fastened to the spears or rods.
Off-putter.—A man employed in shipping the coals.
Onsetter.—The man who sends the coal from the bottom of the pit.
Opencast.—An open cutting.
Outset.—The height which the top of a pit is raised from the surface, generally from 12 to 20 feet.
Outbye—Outbyeside.—Nearer to the bottom of the pit.
Overman.—An underground overlooker.
Overings.—The top framing of a waggon.
Outcrop.—When the coal-measures rise up to the surface.
"Out of the house."—A pumping-engine is said to go out of the house in the down stroke.

Pair of gears.—Two upright props with a cross piece at the top, for the support of the roof, or for forming wood bridges, staiths, &c.
Parting.—A horizontal separation in the coal or stone.
Peck.—A measure containing 1,209 cubic inches.
Pinch.—A lever.
Pick.—An instrument used in working coal, stone, &c.
Plugman.—The man in charge of the pumping-engine.
Plug.—A circular piece of wood to fill up a borehole, &c.
Plum.—Perpendicular.
Post.—Sandstone.
Prop.—A piece of wood for supporting the roof.
Punch-prop.—A short prop.
Putters.—Young men who convey the coals from the workings to the horseway.
Pulleys.—Wheels over which the pit-ropes run at the top of the pit.
Pulley-frames.—Frames for the support of the pulleys.
Ramble.—Stone or refuse coal which lies on the top of the coal-seam, and falls down in working the vein.
Renk.—The average distance the coals are brought by the putters.
Rests.—The machinery at the top and bottom of the pits, on which the shaft carriage is supported during the time of changing the tubs.
Rings.—Gutters cut round the shaft to collect the waste water.
Ridding.—Clearing away a fall of rubbish.
To ride.—To ascend up the pit.
Round coals.—Large coals.
Roof.—The strata immediately above the coal.
Rope-rolls.—The drums on which the ropes of the winding-engine are wound.
Rolleys.—Carriages for conveying the tubs or corves underground.
Rolleyway.—Underground railway.
Rolleywaymen.—Men who lay and repair the rolleyway.
Rusty coals.—Coals discoloured by water or exposure to air.
Settle-bords.—The platform at the top of the pit.
Screens.—Boxes, or spouts placed at an inclination, with longitudinal openings to separate the small coal from the large.
Screener.—A man who fills the coals from the screens into the waggons.
Scale of air.—A small portion of air abstracted from the main current.
Scars.—Clinkers.
Scraper.—An instrument for bringing the dust out of the drill-hole.
Seasale.—Coals sent by shipping.
Shaft.—A pit.
Sheth of bords.—A district of workings.
Sheth-door.—A door used for ventilating the back workings by coursing the air.
Sheth-stopping.—A stopping as above.
Shaft-walls.—Strong pillars of coal left near the bottom of the pit.
Shift.—The time of working for one day.
Shifter.—A man who prepares the working-places at night.
Shear-legs.—A wooden framing used for raising weights, boring, &c.
Sheave.—A wheel or roller.
Sheaths.—The upright framing of a waggon.
Shingley coals.—Small pieces of coal, but free from dust.

Shot.—A charge of powder.
Shifting kavels.—The men who are first for removal from one working-place to another.
Siding.—A turnout where the empty and full sets pass.
Sleck.—Mud deposited by water.
Smart-money.—Money paid weekly by the owners to persons who have received an injury in the work.
Snore-holes.—The holes in the windbore to admit the water.
Sinker.—A man who sinks pits.
Spouts.—Boxes down which the coals are run from the waggons into the ships.
Splitting the air.—Dividing the air into different portions, each ventilating a separate district of the mine.
Spears.—Pumping-rods.
Sneck.—A catch to fasten a door, &c.
Soles.—The bottom framing of a waggon.
Staith.—The shipping-place for the coals.
Staithman.—The man who overlooks the shipping of the coals.
Staple.—A small pit.
Stay.—A support.
Start.—The lever of the crab or gin, to which the horse is attached.
Standage.—Space for water to accumulate in.
Stemming.—The stuff beaten down upon a charge of powder.
Stenton.—A passage between two winning headways.
Stenton-wall.—The pillar of coal between two winning headways.
Stopping.—Walling put into any passage to block it up so as to carry the air forward.
Stonehead.—The rock immediately below the alluvial deposit.
Stowing.—Rubbish put into old workings to fill them up.
Stowbord.—A place into which rubbish is put.
Stythe.—Choke-damp or carbonic acid gas.
Sump.—The bottom of the pumping-pit.—A catchwater drain.—The part of a judd of coal first brought down.
Sumping-shot.—A charge of powder for bringing down the sump, or for blowing the stone up in a sinking-pit.
Swad.—A thin layer of stone or refuse coal at the bottom of the coal-seam.
Tail-crab.—The capstan on which the spare rope of the crab is wound.
Ten.—A measure containing 420 and in other cases 440 bolls, Winchester measure.
Tentale-rents.—Rent paid to the lessor at so much per ton.
"*Tear war.*"—A signal that men are ready at the bottom to ascend up the pit.
Thill.—The floor of the mine.
Towt.—A piece of old rope.
Token.—A piece of leather with a distinct mark for each hewer, one of which he sends up with each corf or tube.
Trapper.—A boy who opens and shuts the air-doors.
Trouble.—A dislocation of the strata.
Trimmers.—Men who spread the coals in the ship's hold.
Tram.—A carriage for carrying the corves or tubs.
Tubs.—Boxes for conveying the coals.

Upcast-pit.—The pit up which the air ascends after ventilating the mine.
Under the top.—In bad roofs where part of the coal is left and cut in the form of an arch.
Underlevel drift.—A drift driven from the pumping-pit to un-water dip-workings.
Vend.—The whole quantity of coal sent from the colliery.
Viewer.—The superintendent of the mine.
Wall.—A passage between the bords.
Waste.—The old workings.
Wailing.—Cleaning the coals.
Waler.—Boys who pick the refuse from the good coals.
Waste-boxes.—Boxes in which the waste water of the pumping-pit is conveyed from the rings.
Wayleave.—Liberty to make a railway over any ground.
Wasteman.—A man who looks after the ventilation.
Waiter-on.—A man who attends at the top of a sinking-pit.
Waggonwright.—A man who makes and repairs the chaldron waggons.
Whin.—Any very hard stone.
Winning.—A new opening.
Winning headways.—Headways driven to explore and open out the coal-seam.
Whole.—Where the coal has not been previously worked.
Whimble.—A hollow instrument for cleaning the rubbish out of a borehole.
Winding-engine.—The engine which draws the coals up the pit.
Windbore.—The pump at the bottom of a set of pumps.

NORTHUMBERLAND AND DURHAM.

Acre, statute.—4,840 square yards.
Acre, Cheshire.—10,240 do.
Adit.—Level driven into the mine from the surface.
Adventurer.—Coal-miner or lessee.
After-damp.—The azotic gas remaining after explosion.
Air current.—Volume of air.
Air-pipes or boxes.—For exhausting or inserting air.
Air-way.—Passage for the air.
Air-pump.—For exhausting air.
Air drawing.—When the pump draws part air and part water.
Alluvial.—The deposit on the rocky strata.
Anthracite Coal.—Stone-coal which yields very little of either smoke or flame.
Available.—Capable of being realized.
Azote.—Gas inimical to animal life.
Back-shaft.—In contradistinction to the coal-drawing shaft.
Back-drift.—Ditto to horse-drift.
Bad Air.—Adulterated with gas.
Band (black).—Scotch ironstone.
Bands.—Layers of shale or sandstone interstratified with the coal.
Band (Heworth).—Peculiar to that locality.
Barrier.—Whole coal left at the boundary or between workings.
Barrow.—Wheel carriage.
Barrow-way.—Tram-road formed with planks.

Basis.—The grounds or foundation.
Basonic.—Of bason shape.
Beam-spring.—Part of the engine-framing.
Bearers.—Women who carry coals upon their backs.
Bearing system.—The carrying of coals upon the backs of females.
Beater.—Part of the blasting apparatus.
Bed.—The surface of strata or bottom of walling.
Bind.—Sandstone or hard shale.
Balance-weight.—To counteract the load.
Baulk.—An interruption in the coal.
Bit.—A little; a boring implement.
Bituminous.—Possessing much bitumen.
Black band.—Ironstone abounding in Scotland.
Black damp.—Carbonic acid gas.
Black Spittle.—The product of the lungs in the blind coal collieries.
Blast.—Explosion of inflammable air or gunpowder.
Blast (Water).—The rushing out of compressed air through water.
Blasting.—Blowing up the coal by means of gunpowder.
Blind Coal.—Anthracite coal.
Block.—Quantity of coal.
Blower.—A violent discharge of gas from an orifice in the stone or coal.
Board-end door.—Used for ventilating that single place.
Boll.—A customary coal measure, 9,678 cubic inches.
Bolt-hole.—For circulating air.
Bore-hole.—To ascertain the strata.
Bore-rods.—To perforate the strata.
Bottom board.—For discharging at the bottom of the waggon.
Boundary.—The division between properties.
Bovey Coal.—A species of lignite, or charred wood.
Brace head.—A boring implement.
Brake.—For retarding machinery; a boring implement.
Brattice.—A wooden partition for conveying air.
Breeding Fire.—Spontaneous ignition from small coals.
Breach.—Breaking through.
Breaker.—One of the colliers who wedges down the coal.
Broad gate.—A main working.
Broad wall.—The taking away of all the coal; long wall.
Brushing.—A violent motion to remove the gas.
Bucket.—Part of the pump apparatus.
Bucket-tree.—The pump to which the bucket-door is attached.
Bunting.—Beam across the shaft.
Burner.—That part of the lamp which contains the wick.
Butty collier.—A contractor for working and conveying the coal.
Cabin.—A hut or hovel.
Cage.—A frame for containing the tubs where conductors are used.
Calcination.—Roasting coal or ironstone.
Cannel coal.—Remarkable for its illuminating power.
Carboniferous.—Strata containing coal.
Carbonized.—Coal coked.
Catch-pin.—Attached to pumping-beam.
Catrake.—Apparatus for regulating the speed of the engine.
Certain rent.—Fixed rent; farm.

Char.—Coke.
Chain pump.—Worked with an endless chain, fitted up with leather buckets fitting the pump; as the chain revolves over a wheel, each bucket delivers a quantity of water.
Chalk.—Carbonate of lime.
Channel.—A grove or space.
Chingle.—Small coal.
Chisel.—A boring instrument.
Chink.—An opening in the strata.
Chirt.—Strata similar to flint, accompanying lead strata.
Choke damp.—Carbonic acid gas, inimical to animal life.
Cinder-coal.—Coke.
Circumferenter.—Miners' compass.
Cistern.—For containing water.
Clack.—A valve at the bottom of the pumps.
Clack door.—Attached to ditto for changing.
Clack-piece.—The pump in which the clack is fixed.
Clams.—Screw hoops around the pumps.
Cleading.—Deals nailed on to the buntings.
Clean coal.—Unmixed with band or refuse.
Clearer.—The collier who holes under the coal.
Cleavage.—Fracture of the coal.
Cliffes hook.—Used in sinking.
Clunch.—A soft white substance like pipe-clay.
Coal-seam.—Bed of coal.
Coal-bason.—The general form of coal-fields.
Coke.—Calcined coal.
Collarings.—Cross timbers to steady the pumps.
Collier.—The worker of coal.
Colliery.—Establishment for raising coal.
Communications.—Holings in the wall.
Column of air.—Air-current.
Column of pumps.—Set of pumps.
Compass.—Circumferenter; surveying instrument.
Conductors.—Guides for the cage, fixed in the shaft, and constructed of wood or iron.
Concession.—Belgian term for lease.
Corf.—Wicker basket for containing coals.
Courses.—Tiers of wood or iron.
Courses (Air).—Passages for the air.
Coursing.—Carrying the air through the workings.
Counter-balance.—A counteracting weight in machinery.
Crack.—Crevice.
Crank.—Force-pump driven by horses or steam to force the water up from the dip.
Crab.—Windlass worked by horses. Varieties: main-crab, ground-crab, tail-crab.
Crab-rope.—For lifting the pumps, &c.
Cradle.—A wooden seat attached to a rope, for working in the shaft.
Crane-place.—The depôt where the coals are transferred from the trams to the rolleys.
'.—The basket used by a bearer-woman to carry coals.

Creep.—The movement of the stratification where the pillars are left too weak, or where the floor is very soft.
Crossing.—Where one column of air is made to cross over another.
Crow-coal.—The uppermost seam.
Crush.—The strata affected by intense pressure; creep.
Cuffat.—The tub used for drawing the coals in Belgium.
Curb.—Ring of wood or iron fixed in the shaft. Varieties: wedging, spiking.
Dart.—The direction of the air-current in drawings.
Dam.—An artificial building for the stoppage of air or water. Varieties: clay, stone, timber, iron.
Davy lamp.—After the inventor, Sir H. Davy, safety-lamp.
Debris.—The refuse of the mine; outcrop of seam.
Dial.—Miners' compass.
Diagonally.—A working pointing in a direction between dip and rise.
Dip.—The lower level of a coal-mine.
Dislocation.—Where one part of the strata has been severed from the other; a dyke or trouble.
District.—Part of a mining-field.
Doggy.—The deputy of the butty collier.
Doors, for checking the air.—Varieties: single, double, sheth, board end, and brattice.
Downcast.—The current of air downwards.
Draft.—The artificial impulse given to the air.
Drainage.—The abstraction of the water of the mine.
Drawdown.—Downcast.
Drift.—Passage excavated in the mine.
Drift (dumb).—Passage allotted to the foul air.
Drill.—Implement for boring, sinking, or blasting.
Drowned.—Workings filled with water.
Dyke.—Interruption in the coal-mine. Varieties: clay, flat, slip, whin.
Dyke (upcast).—Where the coal, on approaching the dyke, is thrown upwards; and, *vice versâ*, downcast.
Edge seams.—Seams which lie at an angle exceeding 40 deg. are called edge seams.
Engine (winding).—For drawing coal.
Engine (pumping).—For drawing water.
Eudiometer.—Apparatus for measuring the velocity of the air.
Explosions (general).—Where considerable quantities of gas explode.
Face airing.—The current passed round the extremity of the workings.
Fall.—When the roof stone gives way.
Fan-blast.—A means of propelling the air-current by the revolutions of a machine.
Fathom.—A measure, 6 feet.
Fault.—Interruption of coal, dyke, trouble.
Feeders (partial).—Temporary springs of water.
Feeders (general).—Do., which remain permanent.
Fighting of pits.—The deviation of the air-current between downcast and upcast.
Fire-damp.—Carburetted hydrogen gas.
Fire (partial).—Common occurrence.
Fire (breeding).—Produced by accumulation of small coals.

Fire-rib.—Barrier of coal for the insertion of dams.
Fire (standing).—When the coal or gas remains seriously ignited.
Fiery mines.—Producing much gas.
Fire-clay.—Shale which withstands fire, produces fire-bricks.
Fish-head.—An implement used for drawing clacks.
Fissure.—The fracture of the strata at a fault, or otherwise.
Filler.—The collier who fills the coal-tubs.
Five-folds.—A set of sheaves for multiplying power for the lifting of pumps, &c.
Flat seams.—In contradistinction to edge seams.
Flakes.—Sheets of vapour nearly inflammable.
Floor.—The strata whereon the coal rests.
Flue.—Horizontal chimney.
Footage.—Rent payable by the foot thick per acre.
Forewinning.—Previous advanced workings.
Foul.—Contaminated with gas.
Formation.—The form or deposition of strata.
Forcing set.—The water forced up by a solid piston, instead of the ordinary pump and bucket.
Fossil.—Alluvial substance now mineralized.
Franc.—French coin, 10*d.*
Funnel.—Erection for receiving or discharging the air.
Furnace.—Large fire either employed for ventilation or otherwise.
Fuze (patent.)—For communicating a light to gunpowder in blasting.
Gag.—Obstruction in the bucket or clack.
Gang.—A company of workmen.
Gallery.—Passage in the mine.
Gangway.—Artificial road constructed of timber.
Gate-road.—Horse-road.
Gear.—Utensils used in mining or machinery.
Geological.—Appertaining to the earth.
Gin (common).—For drawing coals by horse-power.
Gin (cog and rung).—The ancient gin for drawing coals.
Gin (jack).—Especially used for working in the engine-shaft.
Goaf.—A hollow.
Goaves.—Plural of goaf.
Gob.—The part excavated, goaf.
Gravel-bed.—A wash of sand and gravel found many fathoms under the surface.
Greenstone.—Whin, basalt.
Grit.—A rough coarse sandstone.
Ground-spears.—Applied to the hanging of pumps.
Ground-ropes.—Belonging to the five-fold sheaves for do.
Growth of water.—Springs of water.
Gubbin.—A species of ironstone in Staffordshire, found in disconnected rounded masses.
Headways.—Exploring-drifts.
Heapstead.—The elevation of the shaft above the surface for skreens, &c.
Hitch.—A minor fault in which the coal has been severed, not exceeding the thickness of the seam.
Hogger-pump.—The top pump, furnished with leather bag to connect the delivery of water with the cistern.

Hollow.—Gob, goaf.
Hopper.—A chest or receptacle for small coals.
Horse-gate.—Rolley-way.
Hostmen.—A chartered company of merchants for carrying on the coal trade of Newcastle-upon-Tyne.
In-by.—Those portions of the workings beyond the crane or depôt.
Inlet.—Passage into the mine, downcast.
Inferior.—Lying under level or below the other parts.
Intersected.—Cut across.
Inclined plane.—Artificial arrangement for lowering or hoisting the produce of the mine.
Intake.—The passage which conveys the air inwards.
Ignite.—The act of taking fire.
Incombustible.—Incapable of being burnt.
Ironstone.—The raw material, stone of which iron is made.
Jack-roll.—Hand windlass.
Jack-rope.—Attached to jack-gin.
Jigg-brow.—Inclined plane.
Keel.—A barge for conveying coals.
King-post.—Apparatus for strengthening the beam.
Laminated.—Constructed in layers.
Lamp.—For rarefying, safety-lamp.
Lap.—The part whereon the rope coils.
Lessee.—The tenant.
Lessor.—The landlord.
Level (horizontal).—Neither dip nor rise.
Level (free).—Discharging at the surface without engine-power.
Lift.—A column of pumps.
Lifting-pump.—Common pump.
Lodge.—A temporary hut for sinkers.
Long wall.—The taking away of all the coal by first process, in contradistinction to pillar and stall.
Man of war pillars.—Principal support in the thick-coal workings.
Marl.—A species of fire-clay in connexion with magnesian limestone and turf.
Maul.—Used in sinking and coal-working.
Metre.—French measure of 37·39 inches.
Mountain limestone.—Blue, and in contradistinction to the magnesian.
Naked candle.—Unenclosed.
Nip.—An irregularity or thinning in the seam of coal.
Nook.—Angle.
Offtake joint.—For convenience of disjoining.
Opening.—Excavation.
Orrell coal.—Lancashire, celebrated for its superiority.
Outcrop.—Where the seams appear at the surface.
Outlet.—Escape, egress.
Out-by.—The roadways between the crane and the shaft.
Outfittings.—Appendages.
Overlap.—Two seams coming in close contact with each other.
Overman.—The daily manager of the pit.
Do. (*deputy*).—Assistant.
Pannel working.—Working by divisions.

Parrot coal.—The celebrated gas-coal of Scotland.
Passage.—A holing or communication.
Piles.—Planks, the ends of which are armed with iron for penetrating sand.
Pillar.—Block of coal.
Piping.—Conveyance of gas through pipes.
Piston.—The moveable part within the pump.
Pitman.—Collier.
Pit candle.—Purposely small, viz., 30 or 40 to the lb.
Plank (pit).—For supporting the loose stone.
Plate.—A species of shale.
Plunger.—Used in forcing water.
Porous.—Open.
Pricker.—An implement used in blasting.
Prop.—Timber for supporting the roof.
Puddle.—Liquified clay or soil.
Pump-rod.—Attached to the bucket.
Putter.—One who conducts the tub or basket of coals from the hewer.
Pyrites.—Sulphate of iron.
Quadrant.—Temporary pumping-beam at pit top.
Quarter.—The fourth part of a yard = 9 inches, a term applied to the thickness of coal.
Quicksand.—Fine sand so mixed with water as to render it fluid.
Ram.—The plunger of a forcing set of pumps.
Rarefy.—To heat air to produce expansion.
Reek.—Smoke.
Rent (certain).—Fixed, farm.
Rent (royalty).—Payable by the ton.
Rest.—A boring implement.
Return air.—After it has traversed the workings.
Rib-fire.—Coal-barrier for insertion of a dam.
Ring.—Applied to the skips of Staffordshire, also the horizontal groove formed in the shaft for the collection of the water.
Rise.—The upper plane of the coal-bed, in contradistinction to dip.
Robbing.—Cutting away part of the pillars.
Roll.—An excrescence of the roof or floor of the mine.
Roll-rope.—The drum upon which the rope laps.
Rolley (out-by).—The wheel-carriage and horse-road into the mine.
Rolley (in-by).—The horse-carriage used between the crane and the workings.
Rolley-way.—Edge railway, in contradistinction to tram-way.
Roof.—The strata immediately resting upon the coal.
Royalty.—Mine rent, tonnage.
Rubbish.—The debris, waste.
Runner.—A boring implement.
Sandstone.—Silicious strata.
Scaffold.—A wooden platform fixed across the shaft.
Scraper.—A blasting implement.
Section.—Profile of the strata.
Set (standing).—Fixed in a cistern at the bottom of pit.
Set (hanging).—Pumps hung upon chains or ropes.
Shaft.—Pit, round or square; rope-roll shaft.

Shale.—Strata without mixture of silica.
Shear-legs.—Tall framing above the engine-pit.
Sheave.—Pulley.
Sheathing.—Thin deal applied to the joints of tubbing.
Sheth-door.—Or stopping to guide the main air-current.
Shorts.—Prepaid rents for which coals are allowed to be worked.
Side-lane.—A process in the thick coal, preparatory working.
Siding.—Railway pass-by.
Silicious.—Containing silex.
Sinker.—The person who sinks shafts.
Skip.—Frame used in Staffordshire in drawing the coals.
Skeleton-plan.—Confined to the illustration of a certain subject.
Skreen.—Apparatus for separating the small coal from the large.
Slack.—Small coal.
Sledge.—Wooden frame whereon to convey the coal.
Sleeper.—On which the railway is fixed.
Sliver.—Wood or iron between the joints of planks to render them air-tight.
Slot.—A bolt or fastening.
Small coal.—That passed through a skreen or riddle.
Smelting.—The melting of iron from the raw material.
Snore-holes.—For admitting water into the wind-bore of pumps.
Sooty.—The produce of coal from attrition, the appearance at the out-crop.
Sorting.—Separation, classification.
Spanner.—Part of the working gear of engine.
Spare.—A wedge used in the construction of tubbing.
Spigot and Fawcett.—One part of a pipe going within the other.
Spiral.—The centrifugal ventilator of Belgium.
Spontaneous combustion.—Ignition from the decomposition of coal pyrites, &c.
Splint-coal.—Grey laminated open-burning steam-coal.
Splitting.—Subdividing.
Stair.—The ladder or circular apparatus for ascending and descending the Scotch coal-pits.
Staith.—Building wherein to deposit coal for future removal.
Stall.—Excavation, bord, wicket.
Stamper.—For forcing soft stone into the drill-hole.
Standage.—Space for retaining water.
Staple.—A minor shaft sunk from seam to seam.
Start.—The arm of the gin.
Steam-coal.—Open-burning coal, splint, coal that will not cake.
Steel-mill.—The substitute for a candle before the invention of the safety-lamp.
Stem.—To stuff the drill-hole with soft material.
Stenting.—A holing between the pair of exploring drifts or headways.
Stithe.—Carbonic acid gas.
Stone-coal.—Anthracite.
Stone-head.—Top of strata.
Stopper.—Apparatus attached to the skreen for saving the breakage of coals.
Stopping.—To guide the air-current.

Stowing.—The artificial pillaring up of excavation.
Streak.—Imaginary level line, water-level.
Sumerge.—To rise up from below.
Sulphur.—Inflammable or other noxious gas.
Sump.—That part of a shaft sunk below the coal for standage.
Superior.—Lying above.
Surveyor.—The surveyor and planner of the workings.
Sweep.—The oar used at the stern of the coal keel.
Synopsis.—Summary view.
Taille.—Board, wicket, Belgian.
Tapping.—The draining or drawing off.
Thill.—The stratum upon which the coal rests.
Throw.—The effect of slip-dykes, by which one part of the strata is left above the other.
Thrust.—Where the pillars are taken away, and the mine is left a mass of ruin.
Timbering.—Composed of curbs, planks, &c.
Tomahawk.—An implement used in sinking.
Tonnage.—Computing by the ton.
Topit.—An implement used in boring.
Trail.—To draw.
Tram.—A slight wheel-carriage for conveying the tub or basket.
Tram-way.—Rectangular plates of iron constructed for trams with sharp wheels.
Trap-door.—For checking the air-current.
Trapper.—The person who attends the trap-door.
Travel.—The traversing of the air-courses.
Trouble.—Interruption in the coal, fault, dyke.
Trying the candle.—Judging by its appearance as to the state of the air.
Tub.—For drawing water.
Tubbing.—For stopping water, constructed of wood, stone, or metal.
Tube.—A chimney for the purpose of ventilation.
Under-viewer.—The resident or deputy viewer.
Ungeering.—Disconnecting machinery.
Upcast.—The shaft which discharges the air from the mine.
Valve.—F r opening or shutting off air, steam, or water.
V-bob.—A diagonal movement for pumping.
Viewer.—The manager of a colliery.
Vis inertiæ.—A dead weight, gravity.
Waggon-way.—Railway.
Wain.—The cart used for conveying coals previous to the introduction of railways.
Walling.—Building of brick or stone.
Wash.—Formation of sand and gravel.
Waste.—Old workings.
Water-blast.—Compressed air forcing up water.
Waterfall.—Stream of water falling down the shaft.
Water-level.—Neither dip nor rise.
Water-tight.—Impassable to water.
Wayleave.—Right of passage.
Wedging out.—The thinning of strata.
Wilon.—Basalt, greenstone.

While coal.—Before any coal is worked.
Wildfire.—Inflammable air.
Wimble.—An implement used in boring.
Windgate.—Air-passage.
Winding-shaft.—Where the coals are drawn.
Windlass.—Jack-roll, crab, or other purchase.
Winning.—Exploring, the process of establishing a colliery.
Wire-gauze.—The constituent of the safety-lamp.
Witchets.—A wicket, board, stall.
Workable.—Seams sufficiently thick to be worked to a profit.
Working-barrel.—The pump whereon the bucket hooks.
Workings.—The excavations of a colliery.

SPAIN.

Abra.—A fissure, a considerable opening or cavity in the mountain, rock, or lode.
Abronzado.—Yellow copper ore, sulphuret of copper.
Acarreadores.—Wood carriers.
Acero.—Steel.
Achicar.—To decrease, to diminish; applied to the diminution of water in any of the workings, lowering the water in shafts, &c.
Achicadores.—Workmen employed in removing the water in *botas.*
Acuna.—Die for coining.
Acunacion.—Coining.
Acunador.—One who coins.
Acunar.—To coin.
Ademador.—A mining carpenter; a timber-man.
Ademar.—To timber.
Ademe.—Timber-work for supporting and securing the works of the mine.
Adobes.—Unburnt bricks made of straw, earth, and dung, dried in the sun.
Administrador.—Superintendent.
Administracion.—Administration, management.
Afinacion.—Refining.
Agata.—Agate.
Aguafuerte.—Aquafortis, nitrous, or nitric acid.
Ahondar.—To sink, to deepen.
Ahonde.—Sinking or driving downwards.
Alabastro.—Alabaster.
Albanil.—Mason, bricklayer.
Albaradon.—A dyke.
Albayalde.—White lead.
Albergue.—A natural hollow, a den.
Alcohol.—Galena, sulphuret of lead.
Alcribis o Tovera.—The tuyere of a smelting-furnace.
Alear.—To alloy metals.

Aleacion.—The art of alloying metals.
Alhondiga.—Corn-market or public granary.
Alimentos.—In mining, an allowance to mine-owners, as subsistence, until their mines become profitable.
Almacen.—A store-house, store-room, warehouse.
Almadeneta.—A stamp-head.
Almagra.—Ruddle, red ochre.
Almud.—Twelfth part of a fanega.
Alquifol.—Galena.
Alquilar.—To hire.
Alto.—The upper part.
Alumbre.—Alum.
Ambar.—Amber.
Amatista.—Amethyst.
Amianto.—Amianthus.
Amoldar.—To mould.
Amonedar.—To coin.
Amparo.—The maintenance of the legal right of ownership by continued possession. In mining, this can only be preserved by keeping a certain number of men at work at certain periods, as determined by the mining code.
Anchura.—Width, roominess.
Angulo.—An angle, a corner.
Antimonio.—Antimony.
Aparejo.—A tackle, a block and fall, an apparatus; a set of harness for beasts of burden or draft; a pack-saddle.
Apartado.—Establishment for parting silver and gold.
Aperos.—Utensils; also materials, such as gunpowder and paper for blasting, &c.
A pique.—*Trabajar a pique.*—Digging downwards in a vertical direction.
Apolvillados.—Rich ores.
Apuradores.—Men who rewash the earth from the tinas.
Arcilla.—Clay.
Arena.—Sand.
Arenilla.—Fine sand.
Arrastrar.—Applied to where veins unite and form one; to drag.
Arrastre.—Mill for grinding ores, employed in the process of amalgamation of silver ores and of gold.
Arreador.—Horse-driver for malacates.
Arroba.—25 lbs. Spanish weight.
Arriero.—A muleteer.
Arsenico.—Arsenic.
Asbesto.—Asbestus.
Aserrador.—A sawyer.
Aserrar.—To saw.
Asfalto.—Asphaltum.
Astillero.—Open forest, pasture for mules, &c.
Atacadera.—A rammer.
Atacador.—Rod for ramming in the charges for blasting.
Atajador.—A boy who attends the horses and mules.
Atajo abierto.—Applied to a mine when worked in the manner of a quarry, or by an open cut in a rock or mountain.

Atargea.—Water-courses of masonry.
Atecas.—Labourers who collect the water in buckets from the planes of the mines, in order to pass it off by the shafts; also, men who fill the skins in the shafts with water, mud, &c.
Atierres.—Attle, rubbish; in the mine, earth preventing the continuation of the work.
Atisador.—A stoker, man who attends the furnace.
Audiencia.—Principal tribunal of justice.
Aviado.—The mine-owner supplied with funds for working his mines.
Aviador.—He who supplies funds for working mines.
Avio.—Funds advanced for working mines.
Avios.—Implements.
Ayudante.—Assistant.
Azabache.—Jet.
Azanca.—A leat.
Azarcon.—Red lead.
Azogue.—Quicksilver; silver ore adapted for amalgamation.
Azogue apolvillado.—Very good ore for ditto.
Azogue common.—Common ore for ditto.
Azogue ordinario.—Ordinary ore for ditto.
Azogue razonable.—Middling ore for ditto.
Azogue en caldo.—Quicksilver.
Azogueria.—The ware-room, in which quicksilver is kept in store.
Azoguero.—An amalgamator; person who superintends the process of amalgamation.
Azufre.—Sulphur.
Azufre vivo.—Native sulphur.
Bancos.—Rocks, which intercept the vein, or cause it to take a different direction.
Banquillos.—Stools on which the marquetas are placed.
Bano.—The last portion of quicksilver applied to a torta.
Barquina.—A large furnace.
Barquines.—Forge bellows.
Barra.—A bar, an iron crow; equal shares into which the interest in a mine is divided, usually 24 in number.
Barra de plata.—A bar of silver, usually about 135 marcs, or 1,080 oz.
Barranca.—A ravine.
Barrena.—A drill or borer used in blasting.
Barrenadores.—Miners who work with the borer and mallet.
Barrenar.—To bore.
Barrenero.—A boy who attends with the boring-tools.
Barrenos.—Holes made for blasting.
Barreta.—A miner's bar or crow.
Barreteros.—Miners who work with crow-bars, wedges, or pick.
Barro.—Clay, loam, mud.
Basalto.—Basalt.
Batea, or Apuradera.—A bowl used in re-washing.
Baxo.—Beneath, low, lower part.
Beneficiar.—To extract the metal from the ore; to dress ore.
Beneficio.—Making the metallic contents of the ore available by reduction.
Beneficio de cazo.—Reduction of ore by amalgamation, conducted in a copper pan over a fire; hot amalgamation.

Beneficio de hierro.—Reduction of ore by amalgamation, with the addition of fragments of iron.

Beneficio de patio.—Reduction of ore by amalgamation, in sheds or open court-yards.

Beneficio de pella de plata.—Applied when a portion of amalgam of silver is added to the mass under amalgamation.

Beneficio de la colpa.—A method of amalgamation, in which, instead of *magistral*, *colpa* (colcothar) is used.

Beneficio por fuego.—Reduction of ore by smelting.

Berilo.—Beryl.

Bigorneta.—A small anvil.

Bigornia.—An anvil.

Bismut.—Bismuth.

Blandura.—Soft, crumbly ground.

Blenda.—Blende, sulphuret of zinc.

Boca.—Mouth, entrance, or pit of a mine; first opening made in the vein.

Boca mejora.—A shaft or boca to communicate with the entrance of the vein to facilitate the workings.

Bochorno.—Vapour, or foul air; want of ventilation; suffocating heat.

Boletas.—Tickets of sale of ores; cheque tickets; account of charges, and produce of one amalgamation operation.

Bolsa.—A purse; sometimes applied to a bunch of good ore of the supposed shape of a full purse or bag.

Bomba.—A pump.

Bonanza.—Prosperity; fine weather. A mine in *bonanza* is in a prosperous state; stopping costs, yielding profit.

Bordes.—Border; ore left untouched by previous working in an old mine-work.

Bordeta.—A small pillar.

Borrasca.—Adversity; foul weather. A mine in *borrasca* is in an unproductive state; does not stop costs.

Bota.—A leather bag or sack, made of one or more ox-skins, in which water is lifted in the mines.

Bota chica.—Small leather bag.

Bota grande.—Sack made of 2 or 2½ hides, used to extract water, and worked by horse-whims.

Botilla de burro.—Sack, or bag, made of one neat hide, to extract water, and worked by a burro or hand-whim.

Botilla de lomo.—Small sack made of one-third of a hide, to carry water out of small sinkings on men's backs.

Boveda.—Vault, arch.

Braceage.—Brassage in coining.

Broculas.—Drills.

Bronce.—Brass; gun-metal; iron pyrites.

Buytron.—Furnace for smelting ores.

Burilada.—A chip taken from a mass of silver to try whether it be standard.

Burro.—A hand-whim; a windlass.

Busca.—(Search.) The right to employ *buscones* frequently claimed by the administration and persons employed in mines.

Buscones.—Tributors or miners who work on part proceeds; also, those

who search for ores in a metalliferous district generally, or in a mine for such ores as may have been neglected, and left behind by others.

Caballerangos.—Horsekeepers.

Caballitos.—Men who carry the mining captains or others.

Caballo.—A horse; a mass of the steril mountain rock immersed in the lode.

Caballo de tepatate.—A mass of barren rock interposed in a vein.

Cadena.—A chain.

Cajon.—In Peru and Chili two montons of 32 quintals each, 64 quintals.

Cajon de Granza.—The pit to receive the crushed ore.

Cajonero.—A lander, or one who receives the bota or manta at the shaft's mouth.

Cal.—Lime.

Calde Estano.—Calx of tin.

Calderas.—Boilers.

Calentadura.—The first heating of the furnace, or putting the furnace into blast.

Caliche.—Calcareous matters; ores of a calcareous character.

Calicheros.—Lime-burners.

Calientes.—Warm ores (in amalgamation) containing sulphuret of iron and copper, and no calcareous matter.

Caliza, or Cal en piedra.—Limestone.

Cal viva.—Quicklime.

Campistas.—Tributors.

Campo.—A pitch, a working in possession of buscones, or allotted to the proprietors or others.

Canal.—A spout; a canal.

Candallero.—A socket deeper than the chumacera, and used for the same purpose.

Canella.—Used to convey the fire to the charge for blasting.

Canon.—In a mine, a level, or horizontal gallery.

Canos.—Pipes, tubes.

Cantera.—A quarry.

Cantero.—Stonemason; quarryman; a pitcher.

Caparossa.—The person in charge of the sheds under which the tahonas are worked.

Capellinas.—Large iron or copper bells, under which the quicksilver is separated from the silver in the amalgam by distillation.

Carbon.—Coal; charcoal.

Carbon de lena.—Charcoal.

Carbon de piedra, or Carbon de tierra.—Pit coal.

Carboneros.—Carriers, makers, and sellers of charcoal.

Carcamo.—The drain which carries off the earthy matter from the tinas when washing the amalgam.

Cardenillo.—Verdigris.

Carena.—An upright stanchion for supporting machinery.

Carga.—380 lbs. Spanish; a mule-load, varying in the different mining districts; a charge for blasting; a lode.

Carpintero.—A carpenter.

Carilleros.—Ore carriers.

Carretilla de meme.—A wheelbarrow.

Carrita.—A waggon or cart.

Carrilero.—A waggoner.
Casa de moneda.—The mint.
Cascajal.—A gravel-pit.
Cascajo.—Gravel, rubbish.
Caso.—A boiler used in hot amalgamation.
Castillo.—The frame of the stamping-machine.
Castina.—Fluor or flux.
Cata.—A mine of no great depth; a pit made in quest of the vein; a mine denounced for trial.
Catear.—To search for new mines.
Catero.—A searcher for mines.
Caxa.—Money chest; treasury.
Caxa del tiro.—Reservoir at the bottom of the shaft; sump of the pit; that part of the pit below the deepest level driven from it.
Caxo.—A measure of ore containing many quintals, but varying in bulk at different places; a Potosi, 5,000 lbs.; a handbarrow.
Caxoneros.—Landers at the mouth of a shaft.
Cebar.—To feed; to supply a furnace with materials for smelting; to add quicksilver to a mass of ores under amalgamation.
Cebo.—Priming, as of gunpowder; a feed, as oats for horse; second addition of quicksilver to the torta.
Cedazos.—Sieves.
Cendrada.—The bottom of the refining or cupelling furnaces, made of very fine earth and vegetable ashes which have been lixiviated; materials of which a cupelling test is made; the test itself.
Cendradilla ò Galeme.—Cupelo.
Cerro.—A mountain.
Cestas.—Baskets.
Chapas.—Iron blocks on which the stamps fall.
Charqueadores.—Cart-fillers.
Charqueo.—Filling the baskets by hand.
Chichicles.—Crystallized calcareous or other spar.
Chicuites.—Baskets.
Chiflon.—*Trabajar chiflon.*—A phrase, meaning the work making way, both in length and depth.
Chino.—Iron or copper pyrites.
Chumacerá.—An iron socket for the sockets of shafts.
Cielo.—Roof of a work, an upward working. *Trabajar de cielo*, working at the roof or top of the vein.
Cilindro.—A cylinder.
Cinabrio.—Cinnabar; sulphurate of mercury.
Claro.—An open space on the lode from which ore has been taken.
Clavos.—Masses of native metal, bunches or masses of ore; nails.
Cobalto.—Cobalt.
Cobre.—Copper.
Cobre en roseta.—Rose copper.
Cobriso.—An inferior kind of copper ore.
Colero.—Assistant of the underground captain in charge of the peonada, or account of the daily labour.
Cohete.—A cartridge for blasting.
Collado.—A hill.
Colorados.—Ores coloured with red oxide of iron.—See *Pacos.*

Comillo.—A reverbatory furnace.
Comer los pilares.—To take away the pillars of the lode which had been left during the previous working of the mine to support the roof, and consequently to abandon the mine.
Comerse los pilares.—The same as *comer los pilares*, figuratively to abandon a mine.
Compromiso.—A private engagement or undertaking; also a joint-stock undertaking.
Conducta.—A convoy or caravan, conveying the precious metals or coin overland.
Contra cielo.—A rise or working upwards.
Contra mina.—A work of communication between two mines; also an adit.
Convenio.—A legal agreement.
Contra tiro.—Auxiliary pit contiguous to a main pit or shaft, to serve as a footway, or for ventilation.
Copola.—A cupelling-furnace.
Copos, or Paxillas.—In amalgamation, little globules into which the quicksilver forms, when the process is too quick.
Coral.—Copper.
Cortar Pilar.—To complete the pillar, and make a cross passage, and to form a landing-place.
Cortar las sogas.—To abandon a mine; *let;* to cut the ropes.
Costadores.—Wood-cutters.
Costal.—Sack for ore, made of the *pita* or thread of the aloe; a rammer or beetle.
Cras.—An iron cage or frame used in smelting.
Creston.—Out-cropping of a lode; the crest of a lode appearing above the surface of the ground.
Criadero.—A spot which is metalliferous; a spot; a district; a mountain; a rock where ores are supposed to grow.
Criba.—Perforated leather, through which the stamped ore falls into a pit.
Crisolito.—Chrysolite.
Cristal.—Crystal.
Christal de roca.—Rock crystal.
Crucero.—A cross-cut.
Cruces.—The cross-pieces of the arrastres, or grinding-mills.
Cruzada.—Applied to lodes, that which is crossed by another.
Cubo.—A leather or other bucket.
Cuchara.—The scraper used for extracting the pulverized ore or rock in the hole made to receive the charge for blasting; a spoon.
Cuchara de cuerno.—A small horn bowl in which the earth of the tortas is washed, in order to ascertain from time to time the progress of the amalgamation.
Cuele.—The art or effect of cutting or driving a mine; work in any direction; the distance or space advanced in a mining work.
Cuerda.—A rope.
Cueros.—Skins, generally of oxen, cows, &c.
Cuna.—A wedge.
Curtir.—The operation of adding lime to warm ores, or magistral to cold ores in amalgamation.

Cuerpo.—The lode; also body, as *cuerpo de la veta*, body, or main vein of the lode.

Cuerpo alto.—Upper branch of the lode; upper story of a house or store.

Cuerpo baxo.—Lower branch of ditto; ground-floor of ditto.

Cuerpo medio.—Middle branch of ditto.

These three terms are used where a lode is divided into three parallel branches with the same underlay, as at Veta Grande, Guanaxuato.

Dedo.—The 12th part of a palmo; 4 palmos making 1 vara—12 dedos—8 pulgadas, or Spanish inches.

Demasia.—Space unappropriated between mines, or otherwise.

Denuncio—Denunciacion.—Denouncement; a formal application to the court of mines of the district, to have a mine adjudged to the applicant, the workings of which have been abandoned, or inefficiently carried on during the period fixed by the ordinance, or which has never been worked at all. A person has the power of denouncing a mine which has been unworked, or inefficiently worked, or depopulated for more than four months.

Deputacion de mineria.—Mining tribunal.

Derecho.—Straight, right.

Derrumbe, or Derrumbamiento.—The falling in of the works of a mine.

Desaguador.—Water-pipe or conduit.

Desagüe.—Drainage.

Desagües.—Outlets of every description by which the water is got rid of.

Descargue.—Drawing off the last contents of the furnace, blowing out the furnace.

Descostradores.—Men employed in taking down any fragment which may remain after blasting.

Descubridora (mina).—The mine in which the vein has been discovered, and which is entitled by law to a double *pertenencia* if in a district already worked, or a treble *pertenencia* if in a new district.

Desfrutar.—To enjoy, to have the benefit of a mine.

Desmonte.—Clearing away the surface of the ground; removing by the pick, blasting, or otherwise, the mountain rock, or breaking down ores.

Despacho.—Plat; point of junction between a shaft and a level enlarged for receiving the ores, &c. to be sent up the shaft to the surface.

Despachadores.—Men employed in filling the *mantas* with ores, &c.

Despensa.—A store-room for materials and tools, sometimes also for the quicksilver, and even for the bullion.

Despueble.—Abandoning the mine, or omitting to keep the proper number of hands at work.

Destajo.—Piece or contract work; tut-work.

Destajero.—Tut workman, or one who undertakes to work by contract.

Diamante.—Diamond.

Dique.—A dyke.

Echadero.—A plain where mules are loaded, the metal spread out, cleaned, and weighed.

Echado.—Inclination, or dip of the slope.

Eje.—The axis of a wheel, axis of a carriage, &c.

Embolo.—A piston.

Emborrascarse.—Applied to a vein which has become barren as the spot then in work.

Emparejar.—To level or square; to harness cattle, saddle them.
Empleo.—The quantity of quicksilver mixed with the ore on any given occasion for effecting the amalgamation.
En bonanza.—Yielding profitable returns.
Encampanar una mina.—To cut off the workings of a mine on the underlay by working on the lowest works from the neighbouring mine.
Encapillar.—To form a chamber, or an enlargement of a working, preparatory to driving another work from it.
En frutos.—In produce, producing ores.
Ensalmorar.—The first process in amalgamation, the act of mixing the saltierra with the lama.
Ensayador.—Assayer.
Ensaye.—An assay.
Ensayo.—A trial.
Escaleras.—Ladders made of poles of timber, with notches cut in them, or otherwise.
Esmanil.—Blende.
Esmeralda.—Emerald.
Esmeril.—Emery.
Espato.—Spar.
Espato calizo.—Calcareous spar.
Espato fluor.—Fluor spar.
Espato pesado.—Heavy spar; sulphate of lime.
Espejuelo.—Mica.
Espeque.—The cross-level of the noria or tahona to which the mules are harnessed; a lever.
Estaca fixa.—The post driven into the ground, from which the pertenencia is originally measured. *Estaca* means a stake.
Estado.—A statement or account.
Estano.—Tin.
Estanque.—Pond, dam of water.
Estoraque.—Brown blende, sulphuretted zinc.
Faenas.—Work done by common labourers, such as dead-work, removing rubbish, &c.
Faenero.—Rubbish-carrier.
Fanega.—A dry measure, containing 12 celamines, or 1·599 of an English bushel.
Fanegado.—An extent of land; 90½ fenegados are equal to 100 English acres.
Feldespato.—Feldspar.
Fierros.—Stein, vulgarly regulus, from the smelting-furnace.
Flete.—Freight.
Fluorspato.—Fluor spar.
Fluxo.—Flux.
Fondon.—A furnace for smelting ores.
Fosforo.—Phosphorus.
Fosiles.—Fossils.
Fragua.—A forge.
Frios.—In amalgamation, cold ores, those containing calcareous matter, therefore requiring a larger quantity of sulphuric acid from the magistral.
Frente.—An end; a forehead; an extremity of an adit or other level.

Frijolillo.—A breccia.
Frixoles.—French beans, the common food of the country.
Frutos.—Produce, ore.
Fuelles.—Bellows.
Fundidor.—A founder, a smelter.
Fundicion.—Smelting; also, the smelting-house.
Galena.—Galena, sulphuret of lead.
Galera.—A large shed, a mill-house, or grinding-mill; a large building on the floor of which the treading-in of the quicksilver in amalgamation takes place.
Galleria.—A gallery; a level.
Gallos.—Small particles of silver, which appear in the shape of spherules on the surface of certain ores, after they have been strongly heated; more generally, however, applied to the spirting out of the silver from the assay-button on cooling; also fine specimens of native silver, or other rich ores.
Gamela.—A large wooden bowl.
Galpeador.—A miner who works with the mallet or hammer in blasting.
Granada.—Garnet.
Granito.—Granite.
Grano.—A grain.
Granos de oro.—Grains of gold.
Granza.—Coarse particles of ore after grinding, which require to be ground again; brayed ore.
Granzas.—Poor ores.
Grasas.—Slag from the smelting-furnace.
Greda.—Chalk.
Grena.—Ores in the rough state, not cleaned.
Greta.—Litharge, fullers'-earth.
Gualdra.—The large cross-beam in which the upper spindles of the shafts of the machinery traverse.
Guarda.—A rib of different substance from the rock or lode, which generally is upon the sides of the vein, called in Cornwall cupels of a lode or backs.
Guarda raya.—Marks or limits of the boring, or measurement of the work done in a mine; limit or boundary-line.
Guia.—A mark directing to the richest part of the vein.
Guijarro.—Pebble.
Guijo.—The iron spindle of the shaft of machinery.
Guixa.—Quartz.
Hallilitador.—He who supplies money for working a mine.
Hachas.—Axes, hatchets.
Hacienda.—Farm; estate; establishment for reducing ores.
Hacienda de beneficio.—Establishment for reducing ores.
Hacienda de fundicion.—Establishment for smelting ores.
Haciendero.—The superintendent of the hacienda.
Hechado.—Dip of the lode.
Herramienta.—Tools; taken figuratively, it implies a borer and hammerman.
Hierro.—Iron.
Hierro colado.—Cast-iron.
Hierro labrado.—Wrought iron.

Hilo.—A small vein or thread of ore in a lode.
Hilo de la veta.—Line or direction of the vein.
Hilos altos.—Threads or small veins of ore falling into or proceeding from the upper or hanging wall of a lode.
Hilos baxos.—Threads or small veins of ore proceeding from or falling into the lower wall of a lode.
Hoja de lata.—Tin-plate.
Hoja de laton.—Sheet-brass.
Hoja de libro.—Finely laminated clay; talc; lit. leaf of a book.
Horno.—A furnace.
Horno de fundicion.—A smelting-furnace.
Horno de magistral.—Roasting-stove for copper stove.
Huaco.—A hollow.
Hueco.—A hollow place.
Huembas.—Small rough beams of buildings.
Hundido.—Sunk in; workings which have fallen in.
Incorporar.—In amalgamation, to add the first charge of quicksilver. The term *cebar* is applied to the adding the subsequent charges; it also means the act of mixing in thoroughly the whole of the quicksilver, with the torta of wet ore.
Ingenios.—Engines.
Instrumentos.—Instruments, tools.
Intendente.—Intendant.
Interventor.—Inspector, representing the interest of the proprietors by whom appointed, or of the *aviador*.
Irido.—Iridium.
Jantilla.—A double-handed ladle into which the melted silver falls from the cras.
Jaspe.—Jasper.
Jornaleros.—Day labourers.
Jorongo.—A small basket; also a blanket.
Labor.—A work from which ores are extracted; in general, all work of the mine, and especially the front work.
Labores de hacienda.—All workings in a mine not let to tributers.
Ladrillera.—An iron or stone mould in which the melted silver is poured in order to form the barra.
Ladrillos.—Bricks.
Lama.—Slime or schlem from the amalgamation.
Lamero.—The lama when merely thickened by admixture with saltierra.
Lameros.—Lama-pits.
Lancha.—A sort of hard freestone.
Lapiz.—Black lead.
Lapiz encarmado.—Red chalk.
Laton.—Brass.
Lava.—Lava.
Lavador.—A man employed in washing the ore after amalgamation, or rather, in cleansing the amalgam.
Lavaderos.—Gold-washings; washing vats or tubs for separating the amalgam from the lama or slime.
Lazadores.—Men who procure people to work in the mine; also men employed to catch cattle.
Lena.—Fire-wood.

Lenadores.—The workmen employed to carry and serve the wood in the smelting-furnace; also, the wood-cutter; collectors and sellers of fire-wood.

Lenter sillas.—Large vertical wheels of the stamping apparatus.

Ley.—Standard of the metals; contents in pure silver.

Ley de oro.—Quantity of gold contained in the silver.

Ley de plata.—Quantity of silver contained in the ore.

Libramiento.—Warrant for payment for bars of gold or silver delivered at the mint, or order for funds.

Libranza.—A bill of exchange.

Liga.—Flux.

Limadura.—An appearance put on by the quicksilver in certain stages of the process of amalgamation, which is noticed at the edges of the amalgam, washed in the bowl for making a *tentadura*, or trial.

Limpia.—Clearing out of rubbish and ruins from the old work in a mine.

Lis.—A particular state of the amalgam observed by means of the *tentaduras*, or trials, in the bowl.

Llano.—A plain, flat ground.

Llevada.—Carriage; transport.

Llevador.—Carrier, conductor.

Lodo.—Mud.

Losa.—A flat stone.

Lumbrera.—An air-shaft; an adit-shaft.

Macero.—He who has the charge and direction of crushing and grinding the ore in the tahonas, previous to amalgamation.

Macizo.—A solid untouched part of the vein.

Madera.—Timber.

Maestro herrero.—Master blacksmith.

Maestro carpintero.—Master carpenter.

Magistral.—Copper pyrites, used in amalgamation.

Malacate.—A horse-whim.

Malacatero.—A whim driver.

Malacate doble, or Malacate sencillo.—The former whim has bags made of two ox-hides, holding 1,250 lbs. of water; the latter one hide, and holding half the quantity.

Maiz.—Indian corn, the principal food used at the mines.

Manantial.—A spring of water.

Mandadero.—Errand-boy.

Mandon.—Master miner or overseer.

Manga.—Level divided for ventilation; air-pipes; a bag or strainer used to separate the quicksilver from the *pella*.

Manganesa.—Manganese.

Manta.—A blanket, or horse-cloth, used to contain ores or tools to be brought up by the malacates, now replaced generally by sacks made of the fibres of the agave, or ox-hides.

Mantear.—To raise ores from the shaft in bags or mantas.

Manto.—A bed or circumscribed stratum.

Maquina.—A machine.

Maquinas de vapor.—Steam-engines.

Maquila.—Rate paid to the proprietor of a mill, or reduction-work, for reducing ore on another party's account; applied chiefly to reduction by amalgamation.

Maquilero.—One who dresses ores on hire.
Marco.—8 ounces or lb. Spanish, equal to 3,552 grains English.
Marco de oro.—8 ounces of gold.
Marco de plata.—8 ounces of silver. The marco de oro, or marco de plata may be standard, or otherwise.
Marmol.—Marble.
Maroma.—A rope to pull or draw by as a hawser.
Marquesitas.—Mundic; iron pyrites.
Martillo.—A hammer.
Martriquila.—A registry for miners, &c.
Maza.—Stamp-head for pounding the ores.
Mecha.—A match or fuse.
Medida.—A measure.
Mejora.—Improvement.
Mejora de boca.—A term used when an improvement or alteration is made in the entrance to a mine.
Memoria.—Weekly account of disbursements or mine expenses.
Mercurio.—Quicksilver.
Merma.—Loss of quicksilver in amalgamation or of lead in smelting.
Meson.—An inn mostly appropriated to muleteers, &c.
Metal.—Metal, ore.
Metal de ayuda.—Metal or ores added in smelting, to assist in the reduction of the silver ores; lean, or galena, for example.
Metal pepena.—Selected and picked gold and silver ores.
Metales communes.—Common ores.
Metales de fundicion.—Ores for smelting.
Metales plomosos.—Ores impregnated with lead.
Metales porosos.—Porous ores.
Metapiles.—Grindstones used in the tahonas; also pigs of copper used in the hot amalgamation.
Mezquite.—Robinia, or acacia; a wood much used in mines.
Mineral.—Ore; mineral; recently applied to a mining district, formerly and still called Real de Minas.
Mineria, deputacion de.—A tribunal cognizant of mining matters, elected in most cases by the mine-owners of the district.
Minero.—A miner, an underground agent.
Minio.—Red lead.
Modelos.—Models.
Mojon.—A landmark, used to mark the limits of pertenencias.
Molibdena.—Molybdena.
Molienda.—The act of grinding or pounding the ores, sometimes used to designate the ores ground, "*La Molienda.*"
Molinete.—Shaft of tina.
Molino, or Mortero.—Stamping-mill.
Molonques.—Crystallization of silver ores; very rich.
Montana.—A mountain.
Montes.—Woods.
Monton.—A heap of ore; a batch under the process of amalgamation, varying in different mining districts. At Catorce, 36 quintals; at Guanaxuato, 35 quintals; at Real del Monte, Pachuca, Sultepec, and Tasco, 30 quintals; Zacatecas and Sombrerete, 20; Fresnillo, 18; Bolanos, 15; and at Valenciana, 32.

Mozo.—A man-servant.
Muestras.—Samples.
Mufla.—A tuyere.
Natas o Escorias.—Slags.
Natron.—Native carbonate of soda.
Negociacion.—Business; undertaking as a mine, or set of mines, &c.
Niculo.—Nickel.
Nitro.—Nitre.
Nivel.—Level.
Niveles de agua.—Water-levels.
Noria.—An endless chain with buckets attached, revolving round a wheel; it is used underground for drawing water out of the pozos or sinks, which are carried down to a greater depth than the principal shaft; also, a common superficial machine for raising water.
Obras.—Workings.
Ocre.—Ochre.
Ocre rojo, or Ocre colorado.—Red ochre.
Official de carpintero.—Journeyman carpenter.
Official de Albanil.—Journeyman bricklayer.
Ojo.—Bunch or small spot of ore in a lode.
Ojo de polvilla.—Spots of rich ore.
Ojo de vibora.—Black sulphuret of zinc.
Onique.—Onyx.
Opalo.—Opal.
Operarios.—Workmen.
Ordenanzas de mineria.—Code of mining laws.
Oro.—Gold.
Oro de copela.—Fine gold.
Oro empolvado.—Gold dust.
Orphimento, or Oripomente.—Orpiment.
Pacos.—Earthy ores, consisting of oxide of iron mixed with various ores of silver; when of a red colour they are frequently called colcorados; they are generally found near the surface.
Paja.—Straw.
Pala.—A wooden shovel.
Paldion.—Palladium.
Palanca.—A lever, a pole on which a weight is supported by two men.
Palansa de hierro.—Crowbar.
Palmo.—Quarter of a vara or Spanish yard.
Panino.—The ground or country through which the lode runs; also, the matrix.
Panizo.—Hornstone.
Parada.—A relief or change of men, mules, or horses.
Parcionero.—A partner in the mines.
Parihuela.—A letter.
Partido.—Division of ores between the owners and buscones.
Pasta.—Uncoined silver.
Patio.—A yard, court; floor of a court on which the ores pass through the process of amalgamation.
Patio de amalgamacion.—Amalgamation court.
Pegador.—Man who sets fire to the matches for blasting.
Pella.—The silver mixed with quicksilver when all the latter metal has

been forcibly pressed out, except the portion which can only be separated by distillation.

Peltre.—Pewter.

Peones.—Native labourers or assistants; day-labourers.

Pepena.—Picked ore of the best quality; rich ore.

Pepenado.—Cleaned ores.

Pepenadores.—Cobbers, cleaners, and classers of the ores.

Pepitas.—Small grains of native silver or gold.

Peritos.—Intelligent or practical persons selected as arbitrators to decide scientific or practical questions or disputes, or to determine the underlay of veins prior to fixing the limits of the *pertenencias*.

Perla margarita.—Pearl.

Pertenencia.—Extent of 200 varas upon the course of a lode, to which a title is acquired by denunciation; the breadth varies according to the underlay of the vein, from 112½ varas to 200 varas.

Peso.—A dollar; any weight.

Petlanques.—Crystallizations of silver ores; also, silver ores which are very conspicuous in the matrix; for example, petlanque colorado is the red antimonial silver, whether crystallized or otherwise.

Pez.—Pitch.

Pico.—A miner's pick.

Piedra.—Stone.

Piedra de toque.—Touchstone.

Piedra cornea.—Hornstone.

Piedra iman.—Loadstone.

Piedra podrida.—Rottenstone.

Piedra pomez.—Pumice-stone.

Piedras de mano.—Good pieces of ore, sometimes carried up by hand, and often assigned to pious purposes.

Piedras preciosas.—Precious stones.

Pilares, or pilarejas.—The pillars of a mine.

Pileta.—A trough; the hollow basin before the smelting-furnace into which the metal flows; tank or small reservoir underground to collect the water of infiltration.

Pina.—The cake of silver left after the quicksilver has been distilled off.

Pinta.—The appearance, whether favourable or unfavourable, of a fragment detached from the lode; the mark of particular metals by which their value is recognised according to their appearance to the eye.

Pintra.—To exhibit pintas, or indications of ores.

Pirites.—Sulphuret of iron.

Piso.—The bottom or floor of a work.

Pison.—A rammer.

Pita.—Thread made of the fibre of the agave or maguey.

Pizarra.—Slate.

Plan.—A bottom working, or working driven from the bottom of a level, adit, &c.

Plancha.—Pigs, as *plancha de plomo*, pigs of lead.

Plata.—Silver.

Plata de ley.—Standard silver.

Plata pina.—Silver after distilling off the mercury.

Plata parda azule y verde.—Muriate of silver of different colours.

Pleito.—A lawsuit.
Platina.—Platinum.
Plomo.—Lead.
Plomosos.—Applied to ores containing lead.
Poblar.—To set on workmen in any mine.
Polvillones.—Rich ores.
Polvillos.—Applied to ores, tender, rich.
Polvillos buenos.—Good ores of the kind.
Polvo.—Dust.
Polvora.—Gunpowder.
Polvorilla.—Black silver, disseminated sulphuret of silver.
Porfido.—Porphyry.
Potasa.—Potash.
Pozo.—A sink on the inclination of the vein; a pit, a well.
Presa.—A dam.
Protocolo.—Minutes.
Pueble.—Actual labour in the mine, with the number of workmen at least prescribed by the mining laws.
Puertas.—Very strong rock, which conceals the vein, and which requires blasting ere the vein is discovered; also doors.
Pulgada.—An inch.
Quadrado.—A square.
Quajado.—Dull lead ore.
Quarzo.—Quartz.
Quebrado.—A ravine.
Quebradores.—Cobbers or breakers of the ores; men who break up the ores on the surface.
Quemadero.—Burning house or place.
Quemazon.—The barren scorched appearance of the crest of a metalliferous lode protruding from the surface of the mountain.
Quilate.—Synonymous with carat; for example, gold of 22 quilates contains 22-24th parts of pure gold, just as the English standard gold of 22-24th parts of pure gold. The quilate is divided into 4 granos Spanish.
Quintal.—4 arrobas or 100 lbs. Spanish, equal to 101 45-100 lbs. English.
Quita pepena.—A man who stands at the mouth of the shaft to see that none of the metal is stolen.
Ramo.—A branch from the main vein.
Rancho.—A detached farm-house and ground; the house is often nothing more than a hut.
Raya.—Weekly account of the mine expenses.
Rayador.—Clerk who keeps account of the workmen's time, the stores received, &c.
Real.—1-8th of a dollar; a mining district.
Real de minas.—The term generally applied to a mining district; although Mineral de Minas is also now used.
Reata.—A rope about as thick as a finger, or larger, used as lashings to *cargas.*
Reatilla.—A single twisted smaller rope.
Rebaxe.—A working down of high ground.
Reboltura.—A mixture of the ground ore with the usual re-agents or fluxes.

Rebosadero.—Crest of a vein.
Recina.—Rosin.
Recuesto.—Inclination of a vein.
Regador.—One who has a right to a certain share of water for irrigation.
Registrar.—To get an entry made by the proper officer of a party taking possession of a new mine.
Registro.—An entry as above described.
Reliz.—The wall of the vein.
Remolino.—Mass or bunch of ore.
Rendirse.—In amalgamation said of a torta when the amalgamation is complete.
Repasar.—The mixing together of the ore, quicksilver, and other ingredients in the wet state, in order to extract the metal; to work the quicksilver into the tortas of ore under amalgamation, done by treading them with mules or men.
Repasador.—Labourer who treads the quicksilver into the ores under amalgamation.
Rescatador.—Ore purchaser.
Rescate.—Public sale of ores.
Retortas.—Retorts.
Riscos.—Crystals.
Rosicler.—Ruby silver; red antimonial ore.
Rio.—A river.
Rubi.—Ruby.
Ruedas.—Wheels.
Rumbo.—Point of the magnetic compass.
Rumbo de la veta.—Line or direction of the vein.
Saca.—The ore obtained from a mine in a given space of time.
Sacabocados.—Punches.
Sacabuches.—Hand-pumps.
Sal.—Salt.
Sala.—The principal room of a hacienda, or any other building.
Salitre.—Saltpetre.
Sal mineral.—Mineral salt for amalgamation.
Sal tierra.—Impure or earthy salt.
Salineros.—Applied to ores requiring much salt in amalgamation.
Salones.—Saloons, large halls, hollows, or cavities in a lode.
Sangria.—Letting off water by piercing the rock or other substance which dammed it in.
Sanguinaria.—Bloodstone.
Scrape.—Blanket, the usual dress of miners.
Sebo.—Tallow or suet used for machinery, &c.
Sierras.—Saws; chains of mountains.
Silla.—A saddle; a leather which passes over the men's shoulders to protect them in carrying the ore.
Silio de labor.—Land-measure, 5,000 varas in diameter.
Sobrante.—Surplus, profit, residue.
Socabon.—An adit or water-level driven from the earth's surface, either on the course of a lode, or to intersect it.
Soga.—The rope to which the bota is attached.
Soguilla.—The rope for the botillas de burro, botas chicas, or mantas.
Sold adura.—Solder.

Soliman.—Corrosive sublimate.
Sombra.—Shade; grey tinge of certain ores or matrices of ores.
Soto minero.—Sub-miner.
Soplete.—A blow-pipe.
Sucino.—Amber.
Tablas.—Planks.
Tahona.—A mill of small horizontal stones.
Tajadera.—Wedge to break the tines.
Tajo.—A cut.
Tajo abierto.—An open cut.
Talco.—Talc.
Talega.—Bags of dollars containing 1,000.
Tanda.—Task; compulsory labour; days appointed for working the mine; duration of the period in which a regador is entitled to use running water for irrigation.
Tanque.—Tank or artificial pond.
Tantalio.—Tantalum.
Tapa ojos.—Bandage for the eyes; used to cover the eyes of mules when treading the ore in the patio or elsewhere.
Tarea.—A task; also a certain quantity of wood for fuel; the quantity cut upon one task.
Tejamanil.—Shingle for roofing.
Tejo.—Cake of metal.
Telurio.—Tellurium.
Tenates.—Sacks made of pita, or hide, for raising the ore on men's shoulders; large leather or coarse linen bags, in which the tentateros remove the ores and rubbish.
Tenatero.—Ore carrier from the workings to the surface, or to the despacho only.
Tentadura.—An assay or trial.
Tepetate.—Rubbish remaining after cleaning the ores; also applied to all the earth of the mine which contains no metal; barren rock through which the ore runs.
Terquesite.—Native carbonate of soda.
Terreros.—Heaps of attle and rubbish from the mine.
Tesoreria.—Treasury.
Testera.—A dyke interrupting the course of a lode.
Texear bien en horno.—When the litharge is thrown out from the furnace.
Tienda de raya.—A shop at which the miners obtain weekly credit.
Tierra pesada.—Barytes.
Tierras.—Earths, applied to ores, earthy poor.
Tierras appolvilados—Ores a degree inferior to azogues apolvillados.
Tieras communes.—Common earthy ores.
Tierras de morlero.—Poor stamped ores.
Tina.—A vat or jar.
Tiro.—A shaft.
Tiro de mulas.—A set of mules.
Tiro general.—The principal shaft.
Titanio.—Titanium.
Tornero.—A wooden vat.
Torta.—A certain quantity of ore under amalgamation forming one heap, which, being of a flat shape, is called a torta or cake.

Torta rendida.—Amalgam ready to undergo the washing operation.
Trementina.—Turpentine.
Triangulos.—The cogs of the stamps.
Tribunal de minera.—Mining tribunal.
Trompeto.—A small malachite.
Tungstena.—Tungsten.
Turba.—Turf, peat.
Turbit mineral.—Yellow oxide, or sulphuret of mercury.
Uranio.—Uranium.
Vapor.—Steam; foul air in a mine.
Vara.—A Spanish yard, equal to 33 inches English nearly, 109 30-100th varas, equal to 100 English yards.
Velas.—Candles.
Velador.—A watchman who takes care of the mine day and night; an under-miner.
Vena or veta.—A vein or lode; it is called *manta* (a cloak), when it is a bed; *clavada* (upright), when it is vertical or nearly so; *echada* (inclined), when it has a certain dip or inclination; *obliqua* (oblique), when it goes in that direction through the mountain; *serpenteada*, when in a serpentine direction; *socia* (companion), when it is joined with another; *rama* (branch) when it proceeds from the main vein.
Verde tiero.—Verditer.
Vermellon.—Vermilion.
Veta madre.—The mother or principal vein.
Vidrio.—Glass.
Vigas.—Beams, split or sawed timber.
Vitriolo.—Vitriol.
Vitriolo azul.—Blue vitriol.
Vitriolo blanco.—White vitriol.
Vitriolo verde.—Green vitriol or copperas.
Voladoras.—Grinding-stones of the arrastres.
Vuelta.—The glow of the silver in cupellation when the last film of oxide of lead suddenly separates and disappears.
Xabon.—Soap; a peculiar description of ores.
Xabones buenos.—Good ores of the above description.
Xacal.—A hut in which ores and tools are kept.
Yesca.—Tinder or touchwood.
Yeso.—Sulphuret of lime.
Yunque.—Anvil.
Zacate.—Maize straw or grass given to the mules.
Zanca.—A ditch.
Zurron.—A sack made of leather; cochineal is packed Zurrones.

FRENCH, SPANISH, AND GERMAN SMELTING TERMS.

CONTRACTIONS.—Fr. *French*; Sp. *Spanish*; Gm. *German*. *Cp.* Copper; *Sl.* Silver; *Ld.* Lead; *Tn.* Tin; *Ir.* Iron.

Abzug.—Gm. sl.; sulphurated litharge dross, in silver refining.
Abstrich.—Gm. sl.; impure brown litharge, in silver refining.

Arastre.—Sp. sl.; crushing-mill.
Autel.—Fr.; the fire-bridge of the air-furnace.
Aspirateur (fourneau).—Fr.; air or wind furnace.
Affinerie.—Fr.; refining metals.
Blicksilber.—Gm. sl.; crude silver, from silvery lead, not quite fine.
Brandsilver.—Gm. sl.; refined silver, from silvery lead.
Bleistein.—Gm. ld.; regule from coppery (&c.) lead ores.
Brasque.—Fr.; lining of close-beaten charcoal.
Battitures.—Fr.; forge-scales of oxide of iron.
Cingler, Cinglage.—Fr. ir.; shingling.
Crasses.—Fr.; clots, dross.
Castine.—Fr. ir.; limestone.
Carcasses.—Fr. sl.; coppery residues of liquiation for silver.
Cuivre en grains.—Fr. cp.; beanshot copper.
Cuivre en plumes.—Fr. cp.; feathershot copper.
Cuivre noir.—Fr. cp.; coarse copper for refining.
Cuivre ampoulé.—Fr. cp.; crude copper ready for refining, called "pimple copper."
Chemise.—Fr.; lining of a furnace.
Capelline.—Sp. sl.; the iron bell under which the silver amalgam is distilled downward.—See *Pina.*
Creuset.—Fr.; crucible; receiving-pit of a furnace.
Cadmies.—Fr.; metallic soot; sublimate.
Centner.—Gm.; proportionate weight of 100, whether pounds, ounces, loths, or grains.—See *Loth.*
Darrlinge.—Gm. sl.; copper residue from silvery copper, sweated out by lead.
Decrassage.—Fr.; skimming, cleaning.
Dame.—Fr. ir.; the front hearth-stopper of the high blast furnace.
Dunnstein.—Gm. cp.; poor copper regule.
Erzmehle.—Gm.; ground ore.
Etain en larmes.—Fr.; grain tin.
Eclair.—Fr.; the "brightening" of fine silver in cupellation.
Frischstuck.—Gm. sl.; silvery lead eliquiated from silvery copper ore.
Fonte.—Fr.; cast metal; generally cast iron.
Fraisil.—Fr.; broken small charcoal.
Fourneau à manche.—Fr.; low blast furnace.
Floss-ofen.—Gm. ir.; the high blast furnace.
Foyer.—Fr.; fire-hearth of a furnace; focus.
Fonte crue.—Fr.; fusion of regule from raw ore.
Fallung.—Gm.; precipitation in watery solution.
Gahrkupfer.—Gm.; refined copper.
Gahrschlag.—Gm.; refinery slag.
Gahrproof.—Gm.; refining test.
Gahrspan.—Gm.; the refining assay sample.
Gahreisen.—Gm.; the iron rod for drawing the sample.
Gahrost.—Gm.; the copper after the last roasting.
Gift Mehl.—Gm.; arsenic soot.
Hutte.—Gm.; foundry; kiln; smelting-furnace.
Huttenwerke.—Gm.; smelting-house.
Heller.—Gm.; a weight, ½ pfennige; about 7 grs. impl.—See *Pfennige.*
Houille grasse.—Fr.; bituminous coal.

Houille sèche.—Fr. ; coal little or not bituminous.
Kupferstein.—Gm. ; regule from coppery lead ores, twice roasted.
Kupferleg.—Gm. ; regule from bleistein, roasted with quartzy copper ores, &c.—See *Bleistein.*
Krummofen.—Gm. ; low blast furnace.
Kornig.—Gm. ; grainy, as *grob-kornig*, coarse-grained.
Loupe.—Fr. ir. ; the ball or bloom from the puddling furnace.
Lama.—Sp. sl. ; fine ground ore, ore mud.
Loth.—Gm. ; a standard weight about ½ ounce impl.
Laitiers.—Fr. ; fusible slags.
Lingotière.—Fr. ; ingot mould.
Monteros.—Sp. sl. ; stampers.
Monton.—Sp. sl. ; small heaps of ore mud, for amalgamation.
Magistral.—Sp. sl. ; roasted copper ore, for mixing in the amalgam heap.
Matte.—Fr. ; regule, melted sulphuret.
Minéral.—Fr. ; ore.
Neiderschlag.—Gm. ; precipitate.
Noyer.—Fr. sl. ; the assay being covered with unabsorbed litharge.
Offenbruch.—Gm. ; metallic soot or sublimate.
Plom d'œuvre.—Fr. sl. ; silvery lead for refining.
Poussee.—Fr. sl. ; fusion with nitre, to scorify the copper, &c., and leave the silver.
Pina.—Sp. sl. ; piles of amalgam for distilling down the mercury.
Patio.—Sp. sl. ; amalgamation-floor.
Plata pina.—Sp. sl. ; the porous silver cakes left after distilling down the mercury.
Pochers.—Gm. ; poor ore.
Pfennige.—Gm. ; a weight, 1-16th loth. See *Loth.*
Paillasse.—Fr. ; the bed of a furnace.
Quintal métrique.—Fr. ; 100 kilogrammes, nearly 217 imperial pounds.
Quintlein.—Gm. ; a weight, ¼ loth, or 1-16th ounce. See *Loth.*
Rohstein.—Gm. ; copper regule, first fusion.
Rable.—Fr. ; rabble ; a toothless iron rake, for skimming, &c.
Ressuage.—Fr. sl. ; sweating out the lead for eliquiating the silver from silvery copper, &c.
Rafraichissage.—Fr. sl. ; melting the silvery copper, &c. with lead, to extract the silver.
Ringard.—Fr. ; iron rake for stirring melted metal.
Rustine.—Fr. ir. ; backstone of the high furnace hearth.
Rosette.—Fr. cp. ; refined copper, coated with bright red oxide, by plunging, hot, into water.
Rondelle.—Fr. ; the round cake of rosette-copper.
Rost stadeln.—Gm. ; enclosed roasting, sometimes called "case-roasting."
Rotissage.—Fr. ; roasting.
Rosten.—Gm. ; roasting.
Raffinage.—Fr. ; refining.
Réverbère.—Fr. ; reverberatory (furnace).
Réfractaire.—Fr. ; fireproof.
Rocher.—Fr. sl. ; the "branching" thrown out by fine silver in cooling.

Stoffers.—Gm.; pure ore.
Spleiss-ofen.—Gm. cp.; split furnace; refining-furnace with two receivers.
Spurrost.—Gm. cp.; regule after three roastings.
Spurrstein.—Gm.; the spurrost melted.
Speise.—Gm.; metallic sediment from cobalt-glass, contains nickel.
Schlacke.—Gm.; slag, scoria.
Seigerung.—Gm.; eliquiation.
Speissig.—Gm., fibrous, as *klar speissig*, fine fibrous.
Stahlstein.—Gm.; crude steel from the ore.
Scories.—Fr.; metallic slags.
Saigerdorn.—Gm. sl.; the coppery residue from darrlings (which see), after sweating out most of the lead.
Schlakstein.—Gm. cp.; very poor regule, chiefly iron and sulphur.
Saigergasse.—Gm. sl.; eliquiation gutter, to draw off the eliquisting lead from silvery copper, &c.
Saltierra.—Sp. sl.; salt earth (containing 12 or 13 per cent. salt), for mixing in the amalgamation-heap. See *Torta*.
Schlich.—Gm.; fine-ground ore; ore mud.
Stuckofen.—Gm.; half-high blast furnace.
Schachtofen.—Gm. ir.; high blast furnace.
Schlamm.—Gm.; fine ground ore.
Saumons.—Fr.; blocks of metal, especially tin.
Spadele.—Fr.; shovel for turning the roasted ore.
Titre.—Fr.; the proportion of precious metal in an alloy.
Tuyere.—Fr.; tube, blast-pipe.
Trapiche.—Sp. sl.; grinding mill.
Torta.—Sp. sl.; the great flat heap of silver ore, for amalgamation.
Trompe.—Fr.; water-blowing engine.
Tellersilber.—Gm. sl.; silver left from distillation of the amalgam.
Treibheerd.—Gm. sl.; refining-furnace.
Tole.—Fr.; sheet iron.
Triage.—Fr.; sorting, picking.
Treibscherben.—Gm. sl.; large compact cupells; roasting tests.
Trockene Skneidung.—Gm.; separation by fire.
Usine.—Fr.; smelting-house.
Verquicken.—Gm.; amalgamation.
Verschlacken.—Gm.; scorification.
Wismuth Graupen.—Granular bismuth, eliquiated from the ore.

PART IV.

Tabular and Statistical Matter.

In presenting the following Tables, with the Statistical matter appertaining to the working of our Home and Foreign Mines, as also the Imports and Exports of Metals, with Duty of Steam-engines, and a series of useful tables, it is with pride we refer to them, as forming perhaps the most complete series which has yet appeared in print. We are fully sensible that there are other tables which it would have been desirable to have embodied, but the difficulties attendant in acquiring such can hardly be conceived. It is only natural to suppose that the compilation and arrangement must have been the work of considerable time, and have occupied more than one active mind. To those parties who have kindly rendered their aid in this department, among whom we may name Mr. T. B. Sharp as having contributed much useful and valuable matter, and the several parties to whom we are indebted for parliamentary and other returns, our thanks are deservedly due and hereby gratefully tendered. We trust that in our next volume we shall be enabled to render them still more perfect by the addition of many returns connected with the mines and collieries which it was impracticable to obtain for insertion in the present number. As a record and work of reference, we doubt not this portion of the work, to which so much time has been devoted, will be fully appreciated.

WEIGHTS and MEASURES.

By a law passed in the 51st year of the reign of Henry III., A.D. 1266, it was enacted, "that an English penny, called a sterling, round and without clipping, "shall weigh 32 *wheat corns in the midst of the ear*, and that twelve pence do make "one ounce, and that twelve ounces do make one pound."

Some authors consider that the *Avoirdupois* weight was brought into the country at the earliest period of the Romans, and was then called the AUNCEL WEIGHT from its being used with the steel-yard (*Statera Romana*), or with the AUNCEL (*ansula*) or Danish steel-yard, having a fixed weight and movable fulcrum. Others consider that the *Lombards* introduced the Troy and Avoirdupois weights, and that these were first sanctioned by law in 1496. All *butchers* were ordered to provide *beams, and scales*, and weights, which weights were called *haberdupois*, in the 24th year of Henry VIII. The hundred-weight, or rather the long hundred of 112 lbs., was first introduced as an allowance over and above the 100 lbs. in paying *custom dues*; that is, for every 112 lbs. weight of goods *dues* were only demanded for 100 lbs. The long hundred at first was allowed to be reckoned at 120 lbs.; it was subsequently lowered to 112½ lbs., and finally the *half-pound* was omitted, and the hundred-weight then, as now, was reckoned at 112 lbs. to the hundred.

The IMPERIAL WEIGHTS of Avoirdupois, Troy, and Apothecaries' came into use, under authority of a law passed in 1824 (5 Geo. IV., cap. 74), on the first day of May, 1825; and, by an Act passed in 1835 (5 & 6 Wm. IV., cap. 63), the use of all other weights is rendered illegal.

TROY WEIGHT.

Grains.	Pennywts.	Oz.	lbs.
1	0·0416	0·00208·3	0·00017361
24	1	0·05	0·00416
480	20	1	0·083
5760	240	12	1

APOTHECARIES' WEIGHT.

Grns.	Scrup.	Dr.	Oz.	lbs.
1	0·05	0·016	0·002083	0·00017051
20	1	0·33	0·0416	0·003472
60	3	1	0·125	0·010416
480	24	8	1	0·083
5760	288	96	12	1

AVOIRDUPOIS WEIGHT.

Grains.	Dr.	Oz.	lbs.	Qrs.	Cwt.	Tons.
27·34375	1	0·0625	0·00390625	0·0001395089	0·0000348772	0·00000174386
437·5	16	1	0·0625	0·002231428	0·000557857	0·000027892
7000	256	16	1	0·35714285	0·0892857842	0·0044642857
196000	7168	448	28	1	0·25	0·0125
784000	28672	1792	112	4	1	0·05
15680000	573440	35840	2240	80	20	1

TABLE OF EQUIVALENTS.

The following Tables will at once show the Equivalents of Troy weight in Avoirdupois weight, and, *vice versâ*, the equivalents of Avoirdupois weight in Troy weight, so that with the large Avoirdupois weights generally kept on all works the table will set forth what weights are correspondent or accord with the Troy weights: thus—

1 cwt. Avoirdupois will weigh in Troy weight 186 lb. 1 oz. 2 dr. 40 gr., or 784,000 gr. Troy.

1 lb. Troy will weigh in Avoirdupois 13 oz. 7½ grs.

1 lb. Avoirdupois will weigh in Troy 1 lb. 2 oz. 4 drs. 40 grs.

The Troy lb. is 5,760 grs. The Avoirdupois is 7,000 grs.

¼ cwt. of Avoirdupois (or 56 lbs.) is equivalent to 68 lbs. 0 oz. 5 drs. 20 grs. Troy.

56 lbs. Troy are equivalent to 46 lbs. 1 oz. 122½ grs. Avoirdupois.

1 ton Avoirdupois is equivalent to 2,722 lbs. 2 oz. 5 drs. 20 grs. Troy, and 2,240 lbs. Troy are equivalent to 1,843 lbs. 3 oz. 97½ grs. Avoirdupois.

TROY WEIGHT in Grains and in Avoirdupois Equivalents.

Troy.		Avoirdup.	Troy.		Avoirdup.
	Grains.	lb. oz. grs.		Grains.	lb. oz. grs.
Grain ..	1	0 0 1	Lb. 17	97,920	13 15 357½
Scruple	20	0 0 20	18	103,680	14 12 430
Dwt. ..	24	0 0 24	19	109,440	15 10 65
Drachm	60	0 0 60	20	115,200	16 7 137½
Oz. 1	480	0 1 42½	21	120,960	17 4 210
2	960	0 2 85	22	126,720	18 1 282½
3	1,440	0 3 127½	23	132,480	18 14 355
4	1,920	0 4 170	24	138,240	19 11 427½
5	2,400	0 5 212½	25	144,000	20 9 62½
6	2,880	0 6 255	26	149,760	21 6 135
7	3,360	0 7 297½	27	155,520	22 3 207½
8	3,840	0 8 340	28	161,280	23 0 280
9	4,320	0 9 382½	29	167,040	23 13 352½
10	4,800	0 10 425	30	172,800	24 10 425
11	5,280	0 12 30	40	230,400	32 14 275
Lb. 1	5,760	0 13 72½	50	288,000	41 2 125
2	11,520	1 10 145	56	322,560	46 1 122½
3	17,280	2 7 217½	60	345,600	49 5 412½
4	23,040	3 4 290	70	403,200	57 9 262½
5	28,800	4 1 362½	80	460,800	65 13 112½
6	34,560	4 14 435	84	483,840	69 1 402½
7	40,320	5 12 70	90	518,400	74 0 400
8	46,080	6 9 142½	100	576,000	82 4 250
9	51,840	7 6 215	112	645,120	92 2 245
10	57,600	8 3 287½	224	1,290,240	184 5 52½
11	63,360	9 0 360	336	1,935,360	276 7 297½
12	69,120	9 13 432½	448	2,580,480	368 10 105
13	74,880	10 11 67½	560	3,225,600	460 12 350
14	80,640	11 8 140	1120	6,451,200	921 9 262½
15	86,400	12 5 212½	2240	12,902,400	1843 3 87½
16	92,160	13 2 285			

AVOIRDUPOIS WEIGHT in Grains and in Troy Equivalents.

Avoirdupois.		Troy.	Avoirdupois.		Troy.
	Grains.	lb. oz. drs. grs.		Grains.	lb. oz. dr. gr.
Drachm	27·34375	0 0 0 0	Lb. 15	105,000	18 2 6 0
4	109·375	0 0 1 49·375	16	112,000	19 5 2 40
8	218·75	0 0 3 38·75	17	119,000	20 7 7 20
12	328·125	0 0 5 28·125	18	126,000	21 10 4 0
Oz. 1	437½	0 0 7 17½	19	133,000	23 1 0 40
2	875	0 1 6 35	20	140,000	24 3 5 20
3	1,312½	0 2 5 52½	21	147,000	25 6 2 0
4	1,750	0 3 5 10	22	154,000	26 8 6 40
5	2,187½	0 4 4 27½	23	161,000	27 11 3 20
6	2,625	0 5 3 45	24	168,000	29 2 0 0
7	3,062½	0 6 3 2½	25	175,000	30 4 4 40
8	3,500	0 7 2 20	26	182,000	31 7 1 20
9	3,937½	0 8 1 37½	27	189,000	32 9 6 0
10	4,375	0 9 0 55	28	196,000	34 0 2 40
11	4,812½	0 10 0 12½	29	203,000	35 2 7 20
12	5,250	0 10 7 30	30	210,000	36 5 4 0
13	5,687½	0 11 6 47½	40	280,000	48 7 2 40
14	6,125	1 0 6 5	50	350,000	60 9 1 20
15	6,562½	1 1 5 22½	56	392,000	68 0 5 20
Lb. 1	7,000	1 2 4 40	60	420,000	72 11 0 0
2	14,000	2 5 1 20	70	490,000	85 0 6 40
3	21,000	3 7 6 0	80	560,000	97 2 5 20
4	28,000	4 10 2 40	84	588,000	102 0 8 0
5	35,000	6 0 7 20	90	630,000	109 4 4 0
6	42,000	7 3 4 0	100	700,000	121 6 2 40
7	49,000	8 6 0 40	Cwt. 1	784,000	136 1 2 40
8	56,000	9 8 5 20	2	1,568,000	272 2 5 20
9	63,000	10 11 2 0	3	2,352,000	408 4 0 0
10	70,000	12 1 6 40	4	3,136,000	544 5 2 40
11	77,000	13 4 3 20	5	3,920,000	680 6 5 20
12	84,000	14 7 0 0	10	7,840,000	1361 1 2 40
13	91,000	15 9 4 40	Ton 1	15,680,000	2722 2 5 20
14	98,000	17 0 1 20			

The GOLD and SILVERSMITHS' DIVISIONS of the TROY WEIGHT.

OF THE POUND CARRACT.

1 Carract grain is 2½ dwts., or 1 drachm, or 60 troy grains.
1 Carract is 4 carract grains, or ⅙ oz., or 240 ,,
24 Carracts are 12 oz., or 1 lb. troy, or 5,760 ,,

OF THE OUNCE CARRACT.

1 Carract grain is 5 grains, or 5 troy grains.
1 Carract is 4 carract grains, or 20 ,,
24 Carracts are 1 oz. troy, or 480 ,,

THE SMALLER DIVISIONS.

24 Blanks make 1 Periot.
20 Periots ,, 1 Droit.
24 Droits ,, 1 Mite.
20 Mites ,, 1 Grain, or 1 troy grain.
24 Grains ,, 1 Dwt., or 24 ,,
20 Dwt. ,, 1 Ounce, or 480 ,,
12 Ounces ,, 1 Pound, or 5,760 ,,

MEASURES of LENGTH.

Inches.	Feet.	Yards.	Poles or Perches.	Furlongs.	Miles.
1	0·083	0·027	0·0505	0·00012626	0·00001578282
12	1	0·333	0·6060	0·001515	0·000189393
36	3	1	0·1818	0·004545	0·000568181
198	16·5	5·5	1	0·025	0·003125
7920	660	220	40	1	0·125
63360	5280	1760	320	8	1

MEASURES of SUPERFICIES.

Sq. Inch.	Square Feet.	Sq. Yards.	Square Poles.	Roods.	Acres.
1	0·00694	0·0007715	0·0000255076	0·0000006377	0·0000001594
144	1	0·11	0·0036730945	0·0000918274	0·0000229568
1296	9	1	0·0330578512	0·0008264463	0·0002066116
39204	272·25	30·25	1	0·025	0·00625
1568160	10890	1210	40	1	0·25
6272640	43560	4840	160	4	1

MEASURES of CAPACITY.

Cubic inches.	Gill.	Pints.	Quarts.	Gallons.	Pecks.	Bushels.	Quarters.
8·6648076103	1	0·25	0·125	0·03125	0·015625	0·00390625	0·00048828125
34·6592304412	4	1	0·5	0·125	0·0625	0·015625	0·001953125
69·3184609825	8	2	1	0·25	0·125	0·03125	0·00390625
277·2738435700	32	8	4	1	0·5	0·125	0·015625
554·5476871400	64	16	8	2	1	0·25	0·03125
2218·1907485601	256	64	32	8	4	1	0·125
17751·2598848179	2048	512	256	64	32	8	1

LAND MEASURE.

7·92 inches	.. ..	1 link.
100 links, or 22 yards	..	1 chain.
80 chains	.. ..	1 mile.
69·121 miles	.. ..	1 geo. degree.

SURFACE MEASURE.

62·7264 square inches	..	1 square link.
10,000 square links	..	1 sq. chain.
10 square chains	..	1 acre.
640 acres	..	1 square mile.

NAUTICAL MEASURE.

1 nautical mile	..	6082·66 feet.
3 miles	..	1 league.
20 leagues	.. ..	1 degree.
360 degrees	.. ..	the earth's circumference.

SQUARE MEASURE.

144 square inches	..	1 square foot.
9 square feet ..	..	1 sq. yard.
30¼ square yards	..	1 square pole.
40 square poles ..	..	1 rood.
4 roods, or 4840 sq. yds.		1 acre.

CUBIC MEASURE.

1728 cubic inches	..	1 cubic foot.
27 cubic feet ..	..	1 cubic yard.

Note.—A cubic foot is equal to 2200 cylindrical inches, or 3300 spherical inches, or 6600 conical inches.

LIQUID MEASURE.

8·665 cubic inches	.. ..	1 gill.
4 gills	.. ..	1 pint.
2 pints	.. ..	1 quart.
4 quarts, or 277·274 cub. in.		1 gallon.

DRY MEASURE.

2 gallons	.. ..	1 peck.
4 pecks, or 2218·192 cub. in.		1 bushel.
8 bushels	.. ..	1 quarter.
5 quarters	..	1 load.

MISCELLANEOUS.

A cubic inch of distilled water at 62° F. weighs, in vacuo, 252·72 grs.; a cubic foot will therefore weigh 62·3962 lbs. avoirdupois. In air, a cubic inch weighs 252·458 grs., and a cubic foot 62·3206 lbs. An ounce of water = 1·73298 cub. inches.

Imperial gallon = 277·296 cubic inches, or 10 lbs.
Standard avoirdupois pound = 7,000 grs. troy.
,, troy pound = 5,256 grains troy.
,, gallon = 10 lbs. avoirdupois = 277·276 cubic inches.
,, quart = 2·5 lbs. avoirdupois.
,, pint = 1·25 lbs. avoirdupois = 20 oz. distilled water.
,, peck = 2 gallons.
,, bushel = 8 galls. = 80 lbs. avoirdupois of water.
,, 3 bushels = 1 sack.
,, 12 sacks = 1 chaldron.
,, perch = 16½ feet square.
,, rood = 1210 square yards.
,, acre = 4840 square yards = 160 square perches.

Load of unhewn timber ..	40	cubic ft.
Load of squared timber ..	50	—
Load of inch boards ..	600	sq. feet.
Load of two-inch planks	300	—
Hundred of deals	120	in numb.
Hundred of nails	120	—
Thousand of nails ..	1200	—
Load of bricks	500	—
Load of lime	32	bushels.
Load of sand	36	—
Sack of potatoes or coals	224	lbs.
Bushel of salt or flour ..	56	—
Bushel of wheat	60	—
Bushel of barley	50	—
Bushel of oats	40	—

A Spanish and Polish mile is about 3½ English. A Swedish, Danish, and Hungarian mile is from 5 to 6 English miles. A Russian mile, or verst, is about ⅔ of an English mile, and the French toise is about 6 feet.

FOREIGN WEIGHTS and MEASURES.

FRENCH.

DECIMAL WEIGHTS and their EQUIVALENTS in ENGLISH.

	Equivalents in Grains.	TROY.				AVOIRDUPOIS.		
		lbs.	oz.	drs.	grs.	lbs.	oz.	Troy grains.
1 Myrio-gramme..	154340·234	26	9	4	20	22	0	340
1 Kilo-gramme ..	15434·023	2	8	1	14	2	3	121·5
1 Hecto-gramme	1543·402	—	3	1	43	—	3	230·9
1 Deca-gramme ..	154·340	—	—	2	34	—	—	154·3
1 Gramme.. ..	15·434	—	—	—	15·434	—	—	15·434
1 Deci-gramme ..	1·543	—	—	—	1·543	—	—	1·543
1 Centi-gramme	0·154	—	—	—	0·154	—	—	0·154
1 Mille-gramme ..	0·015	—	—	—	0·015	—	—	0·015

Compared with English Imperial Measures.

The metre, or unit of length=3·2809 imperial feet.

The are, or unit of square measure=14 square yards.

The stere, or unit of solid measure=36·31716 cubic feet.

The litre, or unit of measure for liquids=61·028 cubic inches, or about ·453 of an imperial gallon.

The gramme, or unit of weight=15·438 troy grains, or ·002205 of a pound avoirdupois.

The kilogramme=2·205 pounds avoirdupois.

LONG MEASURE.

1 millimetre ..	.. ·039371 imp. in.
10 millimetres ..	.. 1 centimetre.
10 centimetres ..	.. 1 decimetre.
10 decimetres ..	.. 1 metre.
10 metres ..	.. 1 decametre.
10 decametres ..	.. 1 hectometre.
10 hectometres ..	.. 1 kilometre.
10 kilometres ..	.. 1 myriametre,

or 6 miles, 1 furlong, 28 poles, 2½ yards.

SURFACE MEASURE.

1 milliare	.. 1196 sq. yds.
10 milliares	.. 1 centiare.
10 centiares ..	.. 1 deciare.
10 deciares	.. 1 are.
10 ares	.. 1 decare.
10 decares	.. 1 hectare,

or 2·473514 imperial acres.

The are is a square decametre.

SOLID MEASURE.

1 millistere ..	.. ·035317 cubic ft.
10 millisteres ..	.. 1 centistere.
10 centisteres ..	.. 1 decistere.
10 decisteres ..	.. 1 stere.
10 steres ..	.. 1 decastere.
10 decasteres ..	.. 1 hectostere.
10 hectosteres ..	.. 1 kilostere.
10 kilosteres ..	.. 1 myriastere.

The stere is a cubic metre.

MEASURES of CAPACITY.

1 millilitre ..	.. ·061028 cub. in.
10 millilitres ..	.. 1 centilitre.
10 centilitres ..	.. 1 decilitre.
10 decilitres ..	.. 1 litre.
10 litres	.. 1 decalitre.
10 decalitres ..	.. 1 hectolitre.
10 hectolitres ..	.. 1 kilolitre.
10 kilolitres ..	.. 1 myrialitre.

The litre is a cubic decimetre.

MEASURES of WEIGHT.

1 milligramme	.. ·015438 troy gr.
10 milligrammes	.. 1 centigramme.
10 centigrammes	.. 1 decigramme.
10 decigrammes	.. 1 gramme.
10 grammes ..	.. 1 decagramme.
10 decagrammes	.. 1 hectogramme.
10 hectogrammes	.. 1 kilogramme.
10 kilogrammes	.. 1 myriagramme.

A gramme is the weight of a cubic centimetre of distilled water in vacuo at its maximum density, or at 39° Fahrenheit.

SYSTEME USUEL.

The toise usuelle=2 metres, or 6 feet 6⅝ inches.

The pied=13½ inches.

The aune=1⅛ decimetres, or 47½ inch.

The litron=1⅝ imperial pint, nearly.

The boisseau=1⅝ imperial peck.

The livre=7717 troy grains.

MEXICAN WEIGHTS.

12	Granos	1	Tomin										
36	——	3	——	1	Adarma								
72	——	6	——	2	——	1	Drachma						
576	——	48	——	16	——	8	——	1	Onza				
4,608	——	384	——	128	——	64	——	8	——	1	Marco		
9,216	——	768	——	256	——	128	——	16	——	2	——	1	Libra.

WEIGHTS USED in MINING DISTRICTS.

25	lbs. Spanish	1	Arroba			
100	——	4	——	1	Quintal	
300	——	12	——	3	——	1 Carga.

MAIZE or DRY MEASURE.

2	Quarterones	1	Quartillo						
4	——	2	——	1	Almud				
12	——	6	——	3	——	1	Quartilla		
24	——	12	——	6	——	2	——	1	Media
48	——	24	——	12	——	4	——	2	—— 1 Anega
96	——	48	——	24	——	8	——	4	—— 2 —— 1 Carga.

COMPARATIVE WEIGHTS.

1	ounce Troy	contains	480	Grains English.
1	,, Avoirdupois	,,	437½	,,
1	,, Spanish	,,	444	,,
100	grains Mexican	equal to	77 1/5	Grains Troy.

The Mexican league is 5,000 varas, equal to 13,760 feet English, or 2⅝ English miles.

ASSAY EQUIVALENTS.

Ounces per Quintal.		Marcs per Carga.		Marcs per Bolanos Monton, 15 Quintals.		Marcs per Zacatecas Mont, 20 Quintals.		Marcs per Real del Monte Mont, 30 Quintals.		Marcs per Guanaxuato Monton, 32 Quintals.	
oz.	dec.	m.	oz.	m.	oz.	m.	oz.	m.	oz.	m.	oz
	1		3		1·5		2		3		3·2
	2		6		3·0		4		6		6·4
	3		9		4·5		6	1	1	1	1·6
	4		1·2		6·0	1	0	1	4	1	4·8
	5		1·5		7·5	1	2	1	7	2	0
	6		1·8	1	1	1	4	2	2	2	3·2
	7		2·1	1	2·5	1	6	2	5	2	6·4
	8		2·4	1	4	2	0	3	0	3	1·6
	9		2·7	1	5·5	2	2	3	3	3	4·8
1	0		3	1	7	2	4	3	6	4	0
2	0		6	3	6	5	0	7	4	8	0
3	0	1	1	5	5	7	4	11	2	12	0
4	0	1	4	7	4	10	0	15	0	16	0
5	0	1	7	9	3	12	4	18	6	20	0
6	0	2	2	11	2	15	0	22	4	24	0
7	0	2	5	13	1	17	4	26	2	28	0
8	0	2	0	15	0	20	0	30	0	32	0
9	0	3	3	16	7	22	4	33	6	36	0
10	0	3	6	18	6	25	0	37	4	40	0
15	0	5	5	28	1	37	4	56	2	60	0
20	0	7	4	37	4	50	0	75	0	80	0
25	0	9	3	46	7	62	4	93	6	100	0
30	0	11	2	56	2	75	0	112	4	120	0
35	0	13	1	65	5	87	4	131	2	140	0
40	0	15	0	75	0	100	0	150	0	160	0
45	0	16	7	84	3	112	4	168	6	180	0
50	0	18	6	93	6	127	0	187	4	200	0

WEIGHT of a SUPERFICIAL FOOT of various METALS in lbs.

Names.	Thickness by the Birmingham Wire Gauge.														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Iron	12·50	12·00	11·00	10·00	8·74	8·12	7·50	6·86	6·24	5·62	5·00	4·38	3·75	3·12	2·82
Cop.	14·50	13·90	12·75	11·60	10·10	9·40	8·70	7·96	7·20	6·50	5·80	5·06	4·34	3·60	3·27
Brass	13·75	13·20	12·10	11·00	9·61	8·93	8·25	7·54	6·86	6·18	5·50	4·81	4·12	3·43	3·10

	Thickness by the Wire Gauge.														
	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Iron	2·50	2·18	1·86	1·70	1·54	1·40	1·25	1·12	1·00	·90	·80	·72	·64	·56	·5
Cop.	2·90	2·52	2·15	1·97	1·78	1·62	1·45	1·30	1·16	1·04	·92	·83	·74	·64	·58
Brass	2·75	2·40	2·04	1·87	1·69	1·54	1·37	1·23	1·10	·99	·88	·79	·70	·61	·55

	Thickness in parts of an Inch.										
	1/32	1/16	3/32	1/8	5/32	3/16	7/32	1/4	1/3	1/2	1
Iron	2·5	5·	7·5	10·	12·5	15·	17·5	20·	25·	30·	35·	40·
Cop.	2·9	5·8	8·7	11·6	14·5	17·4	20·3	23·2	28·9	34·7	40·4	46·2
Brass	2·7	5·5	8·2	10·9	13·6	16·3	19·0	21·8	27·1	32·5	37·9	43·3
Lead	3·7	7·4	11·1	14·8	18·5	22·2	25·9	29·6	37·0	44·4	51·8	59·2

The WEIGHT or PRESSURE which it is calculated a COLUMN of CAST IRON will sustain with safety.

Length or height in feet.	4	6	8	10	12	14	16	18	20	22	24
Diameter.	Weight in cwts.	Weight in cwts.	Weight in cwts.	Weight in cwts.	Weight in cwts.	Weight in cwts.	Weight in cwts.	Weight in cwts.	Weight in cwts.	Weight in cwts.	Weight in cwts.
In.											
2⅜	119	105	91	77	65	55	47	40	34	29	25
3	178	164	145	128	111	97	84	73	64	56	49
3½	247	232	214	191	172	156	135	119	106	94	83
4	326	310	288	266	242	220	198	178	160	144	130
4½	418	400	379	354	327	301	275	251	229	206	189
5	522	501	479	452	427	394	365	337	310	285	262
6	607	592	573	550	525	497	469	440	413	386	359
7	1032	1013	989	959	924	887	848	808	765	725	686
8	1332	1315	1289	1259	1224	1185	1142	1097	1052	1005	959
9	1716	1697	1672	1640	1603	1561	1515	1467	1416	1364	1311
10	2119	2100	2077	2045	2007	1964	1916	1865	1811	1755	1697
11	2570	2550	2520	2490	2450	2410	2358	2305	2248	2189	2127
12	3050	3040	3020	2970	2930	2900	2830	2780	2730	2670	2600

The relative strength of cast iron being assumed as 1·—, steel will give 2·518, and wrought iron 1·745.

PROGRESSIVE DILATATION of METALS by HEAT, the Length at 62° Fahrenheit being 1000000.

Name of Metal.	At 212° Fahr.	At 662° Fahr.	Fusing Point.
Platinum	1000735	1002995	1009926
Iron, wrought	1000984	1004483	1012378
Iron, cast	1000993	1003943	1015389
Gold	1001025	1004238	
Copper	1001430	1006347	1024376
Silver	1001626	1006886	1020640
Zinc	1002480	1008527	1012681
Lead	1002323		1008972
Tin	1001472		1003798

POWER of METALS for CONDUCTING HEAT.

Gold	1000	Platinum	381	Tin	303·9
Silver	973	Iron	374·3	Lead	179·6
Copper	898·2	Zinc	363		

EFFECTS of HEAT on different METALS.

	Fahr.	Wedg.		Fahr.	Wedg.
	Deg.	Deg.		Deg.	
Extrem. of Wedgwood's Scale ..	32277	240	Lead melts	612	
Platinum melts ..	23177	170	Mercury boils ..	600	
Wrought iron fuses ..	21637	158	Bismuth melts ..	476	
Cast iron melts ..	17977	130	Tin 1, and lead 4, melts	460	
Welding heat of bar iron	13420	94	Tin melts	442	
Fine gold melts ..	5237	32	Tin 3, and lead 2, or tin 2, and bismuth 1, melts	334	
Fine silver melts ..	4717	28	Tin and bismuth, equal parts, melts	283	
Copper melts	4587	27	Bismuth 5, tin 3, and lead 2, melts ..	212	
Brass melts	3807	21			
Iron red-hot in daylight	1907	1			

ORDER of METALS of DUCTILITY.

Wire-drawing Ductility.	Laminable Ductility.
Gold; Silver; Platinum; Iron, wrought; Copper; Zinc; Tin; Lead.	Gold; Silver; Copper; Tin; Platinum; Lead; Zinc; Iron, wrought.

WEIGHT of MODULUS of ELASTICITY of various METALS.

Metal.	Elasticity in lbs.	Metal.	Elasticity in lbs.
Steel	29,000,000	Gun metal	9,873,000
Wrought iron	24,920,000	Brass	8,930,000
Cast iron	18,460,000	Tin	4,608,000
Zinc	13,680,000	Lead	720,000

Note.—The modulus of elasticity for oak is 1,714,500, and for cast iron 18,460,000, or 10·7 times that of oak; hence, cast iron is 10·7 times as stiff as a piece of oak of equal dimensions and bearing.

WEIGHT of LEAD PIPES.

Bore, in inches.	Length, in feet.	Weight of each Length, in lbs.		
		Common.	Middling.	Strong.
½	15	16		
¾	15	24	27	30
1	15	30	40	43
1¼	12	36	44	53
1½	12	48	56	67
2	10	56	70	83
2½	10	70	86	100

WEIGHT of COPPER PIPES, 12 Inches in Length and ½ of an Inch in the Knees.

	Inch.	Inch.	Inch.	Inch.	Inch.	Inch.	Inch.	Inch.	Inch.
Diamete r of Bore....	½	¾	1	1¼	1½	1¾	2	2½	3
Weight, in lbs.....	0·94	1·33	1·69	2·08	2·42	2·87	3·21	3·97	4·78

WEIGHT of a LINEAL FOOT of CAST-IRON PIPES, in POUNDS.

Diamete r of bore, in inches.	Thickness of the Metal, in Inches.							
	⅜	½	⅝	¾	⅞	1	1⅛	1¼
2	8·8	12·3	16·1	20·2				
2½	10·6	14·7	19·2	23·9				
3	12·4	17·2	22·2	27·6	33·3	39·3	45·6	
3½	14·2	19·6	25·3	31·3	37·6	44·2	51·1	
4	16·1	22·1	28·4	35·0	41·9	49·1	56·6	64·4
4½	18·0	24·5	31·4	38·7	46·2	54·0	62·1	70·6
5	19·8	27·0	34·5	42·3	50·5	58·9	67·6	76·7
5½	21·6	29·5	37·6	46·0	54·8	63·8	73·2	82·8
6	23·5	31·9	40·7	49·7	59·1	68·7	78·7	88·8
6½	25·3	34·4	43·7	53·4	63·4	73·4	84·2	95·1
7	27·2	36·8	46·8	56·8	67·7	78·5	89·7	101·2
7½	29·0	39·1	49·9	60·7	72·0	83·5	95·3	107·4
8	30·8	41·7	52·9	64·4	76·2	88·4	100·8	113·5
8½	32·9	44·4	56·2	68·3	80·8	93·5	106·5	119·9
9	34·5	46·6	59·1	71·8	84·8	98·2	111·8	125·8
9½	36·3	49·1	62·1	75·5	89·1	103·1	117·4	131·9
10	38·2	51·5	65·2	79·2	93·4	108·0	122·8	138·1
10½	..	54·0	68·2	82·8	97·7	112·9	128·4	144·2
11	..	56·4	71·3	86·5	102·0	117·8	133·9	150·3
11½	..	58·9	74·3	90·1	106·3	122·7	139·4	156·4
12	..	61·3	77·4	93·6	110·6	127·6	145·0	162·6
13	..	..	83·7	101·2	118·2	137·4	154·1	173·8
14	..	..	89·3	108·2	126·5	146·2	165·3	185·2
15	..	..	95·2	115·7	135·3	156·2	176·2	198·1
16	..	..	..	123·3	143·1	166·1	187·5	211·3
17	..	..	..	130·2	152·5	178·5	198·2	223·4
18	..	..	..	137·0	161·2	185·3	209·1	235·6
19	..	..	..	..	169·2	195·7	222·3	247·1
20	..	..	..	..	178·1	205·2	233·2	259·0

The two flanges of a pipe are considered as equal to the weight of one foot in length.

TABLE of SPECIFIC GRAVITY.

Metals, Names.	Weight, water being 1000.	Number of cubic inches in a lb.	Weight of a cubic inch, in lbs.	Stones, Earths, &c. Names.	Weight, water being 1000.	Weight of a cubic foot, in lbs.	Number of cubic feet in a ton.
Platina	19500	1·417	·7053	Marble, average ..	2720	170·00	13
Pure gold	19258	1·435	·6965	Granite, ditto ..	2651	165·68	13½
Mercury	13568	2·038	·4904	Purbeck stone ..	2601	162·56	13¾
Lead	11352	2·435	·4105	Portland ditto ..	2570	160·62	14
Pure silver	10474	2·638	·3788	Bristol ditto ..	2554	159·62	14
Bismuth	9823	2·814	·3552	Millstone	2484	155·25	14½
Copper, cast.. ..	8788	3·146	·3178	Paving stone ..	2415	150·93	14¾
— sheet ..	8910	3·103	·3225	Craigleith ditto ..	2352	147·62	15
Brass, cast	7824	3·533	·3036	Grindstone ..	2143	133·93	16¾
— sheet.. ..	8396	3·293	·3037	Chalk, British ..	2781	173·81	12¾
Iron, cast	7264	3·806	·263	Brick	2000	125·00	17
— bar	7700	3·592	·279	Coal, Scotch ..	1300	81·15	27½
Steel, soft	7833	3·530	·2833	— Newcastle ..	1270	79·37	28¼
— hard	7816	3·537	·2827	— Staffordshire	1240	77·50	29
Tin, cast	7291	3·790	·2636	— Cannel ..	1238	77·37	29
Zinc, cast	7190	3·845	·26				

EXPANSION of SOLIDS by increasing the Temperature from 32° to 212°, the Length of the Bar at 32° being 1·0000000.

Glass tube	1·00082800	Gold	1·00150000
Platinum	1·00088420	Lead	1·00286700
Antimony	1·00108300	Brass	1·00186671
Cast iron	1·00111111	Wrought iron	1·00125800
Steel	1·00118999	Zinc	1·00294200
Blistered steel	1·00112500	Spelter solder, brass 2, zinc 1	1·00205800
Steel hardened	1·00122500	Soft solder, lead 2, tin 1 ..	1·00250000
Bismuth	1·00139200	Copper 8, tin 1	1·00181700
Silver	1·00189000	Palladium	1·00100000
Tin	1·00217898		

EXPANSION and DENSITY of WATER at various Degrees of Temperature.

Sp. Gr.	Bulk of Water.	Maximum Density 39°.		Bulk of Water.	Sp. Gr.
		Deg.	Deg.		
1·00000	1·00000	38	40	1·00000	1·00000
0·99999	1·00001	37	41	1·00001	0·99999
0·99998	1·00002	36	42	1·00002	0·99998
0·99996	1·00004	35	43	1·00004	0·99996
0·99994	1·00006	34	44	1·00006	0·99994
0·99991	1·00008	33	45	1·00008	0·99991
0·99988	1·00012	32	46	1·00012	0·99988

Note.—The expansion of water is the same for any number of degrees above or below the maximum of density; but the law of maximum of density does not prevail in the case of sea-water; but, on the contrary, is found gradually to increase in weight down to the freezing point.

RELATIVE STRENGTH of BODIES to RESIST TORSION.

Lead	1·0	Swedish iron	9·5
Tin	1·4	English ditto	10·1
Copper	4·3	Blistered steel	16·6
Yellow brass	4·6	Shear ditto	17·0
Gun metal	5·0	Cast ditto	19·5
Cast iron	9·0		

RELATIVE WEIGHT and STRENGTH of ROPES and CHAINS.

Circum. of Rope, in in.	Weight per fathom, in lbs.	Diameter of Chain, in in.	Weight per fathom, in lbs.	Proof strength in tons & cwts.	Circum. of Rope, in in.	Weight per fathom, in lbs.	Diameter of Chain, in in.	Weight per fathom, in lbs.	Proof strength in tons & cwts.
3½	2¾	⅜	5½	1 5½	10	23	¾	43	10 0
4	4¾	7/16	8	1 16½	10½	28	13/16	49	11 11
5	5¾	½	10½	2 10	11½	30½	1	56	13 8
5½	7	9/16	14	3 5½	12½	36	1 1/16	63	14 18
6½	9½	5/8	18	4 3½	13	39	1⅛	71	16 14
7	11½	¾	22	5 2	13½	45	1 3/16	79	18 11
8	15	13/16	27	6 4½	14½	48½	1¼	87	20 8
8½	19	⅞	32	7 7	15½	56	1 5/16	96	22 13
9½	21	15/16	37	8 13½	16	60	1⅜	106	24 18

COMPARATIVE STRENGTH, SIZE, and WEIGHT of IRON-WIRE ROPE, HEMPEN ROPE, and IRON CHAIN.

Breaking weight in tons.	Description.	Size in inches.	Weight per fathom. lbs.	oz.
4	Wire rope	1 circum.	0	12
	Hempen rope	2 do.	1	1
	Chain	¼ diam.	3	0
8	Wire rope	2 circum.	2	10
	Hempen rope	3 do.	6	0
	Chain	⅜ diam.	16	0
12	Wire rope	2½ circum.	4	8
	Hempen rope	7 do.	12	3
	Chain	11/16 diam.	27	0
16	Wire rope	3 circum.	6	12
	Hempen rope	8 do.	14	3
	Chain	½ diam.	36	0
20	Wire rope	3½ circum.	9	4
	Hempen rope	9 do.	19	6
	Chain	13/16 diam.	46	0
24	Wire rope	4 circum.	13	4
	Hempen rope	10 do.	25	0
	Chain	15/16 diam.	53	0
30	Wire rope	4½ circum.	16	5
	Hempen rope	11 do.	30	0
	Chain	1 1/16 diam.	62	0
36	Wire rope	5 circum.	22	5
	Hempen rope	12½ do.	35	10
	Chain	1 3/16 diam.	78	0
44	Wire rope	5½ circum.	27	0
	Hempen rope	14 do.	41	10
	Chain	1 5/16 diam.	96	0
54	Wire rope	6 circum.	34	0
	Hempen rope	15 do.	47	8
	Chain	1 7/16 diam.	115	0

DEPTHS of SQUARE BARS of CAST IRON, calculated to support from 1 Cwt. to 14 Tons in the Centre, the Deflexion not exceeding one-fortieth of an Inch each Foot in Length.

Lengths in Feet.		10	12	14	16	18	20	22	24	26	28	30
Weight in cwt.	Weight in lbs.	Depth.	Depth.	Depth.	Depth.	Depth.	Depth.	Depth.	Depth.	Depth.	Depth.	Depth.
		In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.
1 cwt.	112	1·9	2·0	2·2	2·4	2·5	2·6	2·7	2·9	3·0	3·1	3·2
½	124	2·2	2·4	2·6	2·8	3·0	3·1	3·3	3·4	3·6	3·7	3·8
3	336	2·4	2·7	2·9	3·1	3·3	3·4	3·6	3·8	3·9	4·1	4·2
4	448	2·6	2·9	3·1	3·3	3·5	3·7	3·9	4·0	4·2	4·3	4·5
5	560	2·8	3·0	3·3	3·5	3·7	3·9	4·1	4·3	4·4	4·6	4·8
10	1,120	3·3	3·6	3·9	4·2	4·4	4·7	4·9	5·2	5·3	5·4	5·7
15	1,680	3·6	4·0	4·3	4·6	4·9	5·2	5·4	5·6	5·8	6·1	6 2
1 ton.	2,240	3·9	4·3	4·6	4·9	5·2	5·5	5·8	6·0	6·3	6·5	6·8
1¼	2,800	4·1	4·5	4·9	5·2	5·5	5·8	6·1	6·4	6 6	6·9	7·2
1½	3,360	4·3	4·7	5·1	5·5	5·8	6·1	6·4	6·7	7·0	7·2	7·5
1¾	3,920	4·5	4·9	5·3	5·7	6·0	6·3	6·7	6·9	7·2	7·5	7·7
2	4,480	4·7	5·1	5·5	5·9	6·2	6·5	6·8	7·2	7·6	7·7	8·0
2¼	5,600	4·9	5·5	5·8	6·2	6·6	6·9	7·3	7·6	7·9	8·2	8·5
3	6,720	5·1	5·7	6·1	6·5	6·9	7·3	7·6	7·9	8·3	8·6	8·9
3½	7,840	5·3	5·8	6·3	6·7	7·1	7·5	7·9	8·2	8·6	8 9	9·2
4	8,960	5·5	6·0	6·5	7·0	7·4	7·8	8·2	8·5	8·9	9·2	9·5
5	11,200	5·8	6·4	6·9	7·4	7·8	8·2	8·6	9·0	9·4	9·7	10·1
6	13,440	6·1	6·7	7·2	7·7	8·2	8·6	9·0	9·4	9·8	10·2	10·5
7	15,680	6·3	6·9	7·5	8·0	8·5	8·9	9·4	9·8	10·2	10·6	11·0
8	17,920	6·6	7·2	7·8	8·3	8·8	9·3	9·7	10·1	10·6	10·9	11·3
9	20,160	6·8	7·4	8·0	8·5	9·0	9·5	10·0	10·4	10·9	11·3	11·7
10	22,400	6·9	7·6	8·2	8·8	9·3	9·8	10·3	10·7	11·2	11·6	12·0
15	33,600	7·7	8·4	9·1	9·7	10·3	10·8	11·4	12·3	12·8	13·2	13·7
20	44,800	..	9·0	9·7	10·4	11·0	11·6	12·5	12·7	13·2	13·8	14·3
30	67,200	..	..	10·8	11·5	12·3	12·9	13·5	14 1	14·7	15·2	15·7
40	89,600	..	..	..	12·4	13·1	13·8	14·5	15·1	15·7	16·4	16·9
50	112,000	..	..	..	..	13·6	14·6	15·3	16·0	16·6	17·3	17·9
60	134,000	..	..	..	..	14·5	15·3	16·0	16·7	17·4	18·1	18·7
Deflexion in inches		·25	·3	·35	·4	·45	·5	·55	·6	·65	·7	·75

Examples.—1. To find the depth of a rectangular bar of cast iron to support a weight of 10 tons in the middle of its length, the deflexion not to exceed $\frac{1}{40}$ of an inch per foot in length, and its length 20 feet, also let the depth be 6 times the breadth.

Opposite 6 times the weight and under 20 feet in length is 15·3 inches the depth, and $\frac{1}{6}$ of 15·3=2·6 inches the breadth.

2. To find the diameter for a cast-iron shaft or solid cylinder that will bear a given pressure, the flexure in the middle not to exceed $\frac{1}{40}$ of an inch for each foot of its length, the distance of the bearings being 20 feet, and the pressure on the middle equals 10 tons.

Constant multiplier 1·7 for round shafts, then $10 \times 1{\cdot}7 = 17$. And opposite 17 tons and under 20 feet is 11·2 inches for the diameter.

But half that flexure is quite enough for revolving shafts: hence $17 \times 2 = 34$ tons, and opposite 34 tons is 13·3 inches for the diameter.

The above calculations of the strength of cast-iron bars are founded on experiments by Mr. Hodgkinson of Manchester, and are extracted from his new edition of Tredgold.—(*Abstract of Table, Weale's Engineer's Pocket-book.*)

WEIGHT of a LINEAL FOOT of FLAT BAR IRON, in lbs.

Breadth in inches.	Thickness, in parts of an Inch.								
	¼	5/16	⅜	7/16	½	⅝	¾	⅞	1
1	·836	1·044	1·253	1·461	1·670	2·088	2·506	2·923	3·340
1⅛	·939	1·174	1·409	1·644	1·878	2·348	2·818	3·287	3·756
1¼	1·044	1·305	1·566	1·826	2·088	2·609	3·132	3·653	4·176
1⅜	1·148	1·435	1·722	2·009	2·296	2·870	3·444	4·018	4·592
1½	1·252	1·566	1·879	2·192	2·504	3·131	3·756	4·384	5·008
1⅝	1·356	1·696	2·035	2 374	2·716	3·392	4·070	4·749	5·432
1¾	1·462	1·827	2·192	2·557	2·924	3·653	4·384	5·114	5·848
1⅞	1·566	1·957	2·348	2·740	3·132	3·914	4·696	5·479	6·264
2	1·671	2·088	2·505	2·922	3·342	4 175	5·010	5·845	6·684
2⅛	1·775	2·218	2·662	3·105	3·550	4·435	5·324	6·210	7·100
2¼	1·880	2·348	2·818	3·288	3·760	4·696	5·636	6·575	7·520
2⅜	1·984	2·479	2·975	3·470	3·968	4·957	5·950	6·941	7·936
2½	2·088	2·609	3·131	3·653	4·176	5·218	6·262	7·305	8·352
2⅝	2·193	2·740	3·288	3·836	4·386	5·479	6·576	7·671	8·772
2¾	2·297	2·870	3·444	4·018	4·594	5·740	6·888	8·036	9·188
2⅞	2·402	3·001	3 601	4·201	4·804	6·001	7·202	8·402	9·608
3	2·506	3·131	3·759	4·384	5·012	6·262	7·516	8·767	10·024

WEIGHT of a LINEAL FOOT of SQUARE and ROUND BAR IRON.

Side and diameter, in inches.	Square, in lbs.	Number of lineal feet in 1 cwt.	Round, in lbs.	Number of lineal feet in 1 cwt.	Side and diameter, in inches.	Square, in lbs.	Number of lineal feet in 1 cwt.	Round, in lbs.	Number of lineal feet in 1 cwt.
¼	·209	536	·164	683	3¼	32·618	3½	25·620	4½
5/16	·326	343½	·256	437½	3⅜	35·279	3	27·709	4
⅜	·470	238	·369	303½	3½	38·045	3	29·881	3½
7/16	·640	175	·503	224½	3⅝	40·916	2½	32·170	3½
½	·835	134	·656	170½	3¾	43·890	2½	34·473	3½
9/16	1·057	106	·831	134½	3⅞	46·969	2½	36·895	3
⅝	1·305	86	1·025	109½	4	50·153	2½	39·398	2½
11/16	1·579	71	1·241	90½	4¼	53·440	2	41·984	2½
¾	1·879	59½	1·476	76	4½	56·833	2	44·637	2½
13/16	2·205	51	1·732	64½	4¾	60·329	1½	47·385	2½
⅞	2·558	44	2·011	55½	4⅞	63 930	1½	50·211	2½
15/16	2·936	38	2·306	48½	4½	67·637	1½	53·132	2½
1	3·340	33½	2·624	42½	4⅝	71·445	1½	56·113	2
1¼	4·228	26½	3·321	33½	4¾	75·359	1½	59·187	1½
1½	5·219	21½	4·099	27½	4⅞	79·378	1½	62·344	1½
1⅝	6·315	17½	4·961	22½	5	83·510	1½	65·585	1½
1¾	7·516	15	5·913	19	5¼	92·469	1½	72·618	1½
1⅞	8·820	12½	6·928	16½	5½	101·036	1½	79·370	1½
1½	10·229	11	8·043	14	5¾	110·429	1	86·731	1½
1⅛	11·743	9½	9·224	12½	6	120·243		94·510	1½
2	13·360	8½	10·496	10½					
2⅛	15·083	7½	11·846	9½					
2¼	16·909	6½	13·282	8½					
2⅜	18·840	6	14·797	7½					
2½	20·875	5½	16·396	6½					
2⅝	23·115	5	18·146	6½					
2¾	25·259	4½	19·842	5½					
2⅞	27·508	4	21·684	5½					
3	30·070	3½	23·633	4½					

NOTE.—The weight of bar iron being 1;

The weight of cast iron	=	·96
— steel	=	1·02
— copper	=	1·15
— brass	=	1·09
— lead	=	1·48

TABLE of the WEIGHT of TIN PLATES as manufactured in England.

	Brand Mark.	Number of Sheets per Box.	Length and Breadth.	Weight per Box.		
			In. by In.	cwt.	qrs.	lbs.
One Box of	1 C or 1 Com. ..	225	13½ by 10	1	0	0
	2 C	225	13½ ,, 9½	0	3	21
	3 C	225	12½ ,, 9½	0	3	14
	H C	225	13½ ,, 10	1	0	7
	H X	225	13½ ,, 10	1	1	7
	1 X	225	13½ ,, 10	1	1	0
	2 X	225	13½ ,, 9½	1	0	21
	3 X	225	12½ ,, 9½	1	0	14
	1 XX	225	13½ ,, 10	1	1	21
	1 XXX	225	13½ ,, 10	1	2	14
	1 XXXX	225	13½ ,, 10	1	3	7
	DC	100	16½ ,, 12½	0	3	21
	DX	100	16½ ,, 12½	1	0	14
	DXX	100	16½ ,, 12½	1	1	7
	DXXX	100	16½ ,, 12½	1	2	0
	DXXXX	100	16½ ,, 12½	1	2	21
	SDC	200	15 ,, 11	1	2	0
	SDX	200	15 ,, 11	1	2	21
	SDXX	200	15 ,, 11	1	3	14
	SDXXX	200	15 ,, 11	2	0	7
	SDXXXX	200	15 ,, 11	2	1	0
	Wasters or We and X mixed	225	13½ ,, 10	1	0	14
	TT	450	13½ ,, 10	1	0	0
	XTT	450	13½ ,, 10	1	0	14

CUBICAL CONTENTS of 11-Inch Planks, 9-Inch Deals, and 7-Inch Battens, of 2½ and 3 Inches in thickness.

Length in feet.	Planks, 11 by 2½ in.	Planks, 11 by 3 in.	Deals, 9 by 2½ in.	Deals, 9 by 3 in.	Battens, 7 by 2½ in.	Battens, 7 by 3 in.
	ft. in. pts.	ft. in. pts.	ft. in. pts.	ft. in. pts.	ft. in. pts.	ft. in. pts.
8	1 6 4	1 10 0	1 3 0	1 6 0	0 11 8	1 2 0
10	1 10 11	2 3 6	1 6 9	1 10 6	1 2 7	1 5 6
12	2 3 6	2 9 0	1 10 6	2 3 0	1 5 6	1 9 0
14	2 8 1	3 2 6	2 2 3	2 7 6	1 8 5	2 0 6
16	3 0 8	3 8 0	2 6 0	3 0 0	1 11 4	2 4 0
18	3 5 3	4 1 6	2 9 9	3 4 6	2 2 3	2 7 6
20	3 9 10	4 7 0	3 1 6	3 9 0	2 5 2	2 11 0
	Number of each to equal a Load of 50 cubic feet.					
8	32½	27½	40	33⅓	51⅔	43
10	26⅓	22	32	26⅔	41⅓	34⅓
12	22	18⅓	26⅔	22⅓	34⅓	28⅔
14	18⅔	15⅔	23	19	29⅔	24⅓
16	16⅓	13⅔	20	16⅔	25⅔	21⅓
18	14⅔	12⅓	17⅔	15	23	19
20	13	11	16	13⅓	20⅔	16⅔

TABLE of the AREAS of CYLINDERS.

Diameter of Cylinder.	Area of Cylinder.	Diameter of Cylinder.	Area of Cylinder.
Inches.	Square Inches.	Inches.	Square Inches.
9	63·58	12½	122 65
10	78·5	13	132·66
10½	86·56	13½	143·02
11	95·01	14	153·96
11½	103·84	14½	165·04
12	113·07	15	176·62

Note.—The areas of cylinders are as the squares of their diameters.

The diameter of a circle being 1, its circumference equals 3·1416.

The square of the diameter of a circle being 1, its area equals ·7854.

The circumference of a cylinder, multiplied by its length or height equals its convex surface.

The area of the end of a cylinder, multiplied by its length, equals its solid contents.

The area of the internal diameter of a cylinder, multiplied by its depth, equals its cubical capacity.

The square of the diameter of a cylinder multiplied by its length and divided by any other required length, the square root of the quotient equals the diameter of the other cylinder of equal contents or capacity.

The capacity of a cylinder 1 foot in diameter and 1 foot in length, equals 4·895 imperial gallons.

The capacity of a cylinder, 1 inch in diameter and 1 foot in length, equals ·034 of an imperial gallon.

The capacity of a cylinder, 1 inch in diameter and 1 inch in length, equals ·002833 of an imperial gallon.

The capacity of any cylinder in imperial gallons is obtained by multiplying the square of its diameter by its length, or the capacity of any other sphere by the cube of its diameter, and by the number of imperial gallons contained as above in the unity of its measurement.

TABLE of the PROPORTIONS of HEATING SURFACE and AREA of FIRE-GRATE compared with the quantity of water evaporated, and of fuel consumed, in the Cornish and Boulton and Watt boilers.

	Place.	Number of boilers.	Boiler surface exposed to fire and flues.			Weight of fuel burnt per square foot of grate per hour.
			Per square foot of fire-grate.	Per lb. of water evaporated per hour.	Per lb. of fuel consumed per hour.	
			sq. ft.	sq. ft.	sq. ft.	lbs.
Boulton & Watt boilers.	Albion Mills ..	1	21·28	0·15	1·294	16·44
	Old Ford	1	15·78	0·163	1·3	12·21
Cornish boilers.	Wheal Towan	3	36·11	1·205	12·75	2·83
	United Mines.	3	43·88	1·022	10·72	4·09
	Old Ford	4	43·7	1·56	13·1	3·64

By this table it appears, that in the Cornish boiler,

1st. The ratio of the area of the heating surface to that of the fire-grate is more than twice as great as in the common boiler.

2nd. The proportion of heating surface to the quantity of water evaporated, or of fuel consumed, in a given time, is about ten times as great.

3rd. The rate of combustion is slower with the Cornish boiler than with the common one, in the proportion of about 1 to 4.

One pound of steam will raise 3,657 cubic feet of air 10°, and cause it to expand from 32° to 42°, about 3,733 cubic feet.

The heat that would raise 1 pound of water 1° would raise a pound of air 3°·7: one pound of air = about 11 cubic feet.—(*Weale's Engineer's Pocket-Book.*)

ALLOYS and COMPOSITIONS.

Chinese white Copper.—40·4 parts copper, 31·6 nickel, 25·4 zinc, and 2·6 iron.

German Silver.—1 part nickel, 1 zinc, and 2 copper; when intended for rolling into plates, 25 nickel, 20 zinc, and 60 copper, to which may be added 3 of lead.

Manheim Gold.—3 parts copper, 1 zinc, and a small quantity of tin.

Alloy of the Standard Measures used by Government.—576 parts copper, 59 tin, and 48 brass.

Bath Metal.—32 parts brass, 9 parts zinc.

Speculum Metal.—6 parts copper, 2 parts tin, and 1 of arsenic; or, 7 of copper, 3 of zinc, and 4 of tin.

Hard Solder.—2 parts copper and 1 part zinc.

Blanched Copper.—8 parts of copper and ½ part arsenic.

Britannia Metal.—4 parts of brass and 4 of tin; when fused, add 4 of bismuth and 4 of antimony. This composition is added at discretion to melted tin.

Plumber's Solder.—Equal parts of lead and tin.

Tinman's Solder.—2 parts of lead and 1 of tin.

Pewterer's Solder.—2 parts of tin and 1 of lead.

Common Pewter.—4 parts of tin and 1 of lead.

Best Pewter.—100 parts of tin and 17 of antimony.

A Metal that expands in cooling.—9 parts of lead, 2 of antimony, and 1 of bismuth. This metal is very useful in filling small defects in iron castings, &c.

Queen's Metal.—9 parts of tin, 1 of antimony, 1 of bismuth, and 1 of lead.

Mock Platinum.—8 parts of brass and 5 of zinc.

Silver Coin of Britain.—$11\frac{1}{10}$ pure silver and $9\frac{9}{10}$ copper.

Gold Coin of Britain.—11 parts pure gold and 1 copper. Previous to 1826, silver formed part of the alloy of gold coin; hence the different colour of our gold money.

Ring Gold.—6 dwts. 12 grains pure copper, 3 dwts. 16 grains fine silver, and 1 oz. 5 dwts. pure gold.

Mock Gold.—Fuse together 16 parts of copper, 7 of platinum, and 1 of zinc. When steel is alloyed with $\frac{1}{100}$ part of platinum, or with $\frac{1}{256}$ part of silver, it is rendered much harder, more malleable, and better adapted for every kind of cutting instrument.

NOTE.—In making alloys, care must be taken to have the more infusible metals melted first, and afterwards add the others.

Composition used in welding Cast Steel.—Take of borax 10 parts, sal-ammoniac 1 part; grind or pound them roughly together; then fuse them in a metal pot over a clear fire, taking care to continue the heat until all spume has disappeared from the surface. When the liquid appears clear, the composition is ready to be poured out to cool and concrete; afterwards being ground to a fine powder, it is ready for use.

To use this composition, the steel to be welded is raised to a heat which may be expressed by "bright yellow;" it is then dipped among the welding powder and again placed in the fire until it attains the same degree of heat as before; it is then ready to be placed under the hammer.

Cast-Iron Cement.—Take of clean borings or turnings of cast iron 16 parts, of sal-ammoniac 2 parts, and flour of sulphur 1 part; mix them well together in a mortar and keep them dry. When required for use, take 1 part of the mixture and 20 parts of clean borings, mix thoroughly, and add a sufficient quantity of water.

NOTE.—A little grindstone-dust added improves the cement.

Booth's Patent Grease for Railway Axles.—Water 1 gallon, clean tallow 3 lbs., palm-oil 6 lbs., common soda ½ lb.; or, tallow 8 lbs., and palm-oil 10 lbs. The mixture to be heated to about 210° F., and well stirred till it cools down to about 70°, when it is ready for use.

Cement for Steam-pipe Joints, &c. with faced flanges.—To 2 parts of white lead mixed add 1 part red lead dry, grind or otherwise mix them to a consistence of thin putty, apply interposed layers with one or two thicknesses of canvas or gauze wire, as the necessity of the case may be.—(*Weale's Engineer's Pocket-book.*)

TABLE of ALLOYS, SOLDERS, and AMALGAMS, EMPLOYED in the ARTS.

BY M. CHAUDET, ASSAYER OF THE MINT, PARIS.

ALLOYS.

Gold coin—French standard	Gold, 900; copper, 100.
Silver coin ditto	Silver, 900; copper, 100.
Billon ditto	Copper, 800; silver, 200.
Gold medals ditto	Gold, 916; copper, 84.
Bronze medals, cast (these wear a long time)	Copper, 92; tin, 8.
Jewellery—French standard	Gold, 750; copper, 250.
Silver plate ditto	Silver, 950; copper, 50.
Gold coin—United States standard	Gold, 899·22; copper and silver, 100·78.
Silver coin ditto	Silver, 892·43; copper, 107·57.
Gold coin—English standard	Gold, 916·67; silver and copper, 83·33.
Silver coin ditto	Silver, 925; copper, 75.
Imitation gold	Copper, 91; tin, 9·50. [lead, 0·82.
Imitation silver (Chinese Packford)	Copper, 61·27; zinc, 26·78; nickel, 15·13;
For cannon	Copper, 100; tin, 11. [lead, 1·37.
Statues (Keller's)	Copper, 91·40; zinc, 5·53; tin, 1·70;
Bronzes and candelabras	Copper, 82·00; zinc, 18·00; tin, 3·00;
Mounting of fire-arms	Copper, 80; zinc, 17; tin, 3. [lead, 1·50.
Cymbals, Chinese gongs, &c.	Copper, 80; tin, 20.

This alloy is very hard; it is annealed by dipping, while red-hot, into water, and is then malleable; whilst, if suffered to cool gradually, it is excessively hard.

Bells	Copper, 75; tin, 25.
Reflectors of telescopes	Copper, 2; tin, 1.
Brass for lathes	Copper, 65·80; zinc, 31·80; lead, 2·15.
Brass for the hammer	Copper, 70·10; zinc, 29·90.

This is an important alloy, first made by M. Chaudet.

Types	Lead, 80; antimony, 20.
Alloy fusible in boiling water	Bismuth, 8; lead, 5; tin, 3.
Plugging teeth	Bismuth, 8; lead, 5; tin, 3; mercury, 16.
For tinning iron	Tin, 8; iron, 1.
To make ductile gold of 18 carats, 95·0 fine	Gold, 990; copper, 10.
Bells of mantel clocks	Copper, 75; tin, 25.
Pivots of artificial teeth	Platinum, —; silver, — (*P. N. Johnson*).
Ditto* ditto	Palladium, 50; silver, 50.
Springs of† ditto	Palladium, 50; silver, 30; copper, 50; tin, 10 (*P. N. Johnson*).

SOLDERS.

For gold of 750, or 18 carats	Gold of 750, 2·00; copper, 0·50; silver,
Silver of 750	Silver, 2; brass, 1. [0·50.
Brass	Copper, 50; zinc, 50.
Lead	Lead, 2; tin, 1.

AMALGAMS.

Gold for gilding on metal	Mercury, 91 to 89; gold, 9 to 11.
Silver for ditto	Mercury, 85; silver, 15.
For taking impressions of seals	Copper, —; mercury, —.

This amalgam is hard, and melts at a low heat; it was used by Fouché for the purpose of opening and resealing letters. The proportions are, of course, not given.

Silvering mirrors	Tin, 70; mercury, 30.
Silvering globes of glass	Mercury, 80; bismuth, 20.
For cushions of electrical machines	Mercury, 2; tin, 1; zinc, 1.

* A very important and useful alloy, employed in the manufacture of philosophical instruments, as a substitute for platinum, to which it is superior in hardness and colour, and yet not oxydizable under ordinary circumstances.

† Another very useful alloy, possessing a degree of elasticity inferior only to steel, combined with the advantages of superior hardness and lightness over platinum.

ANTHRACITE COAL in PENNSYLVANIA.

The development of the Coal Mines in this state appears to be progressing favourably. The annexed statement will show the produce of the year 1848 from the different localities, as compared with the preceding year:—

	Schuylkill.	Pine Grove.	Little Schuyl.	Lehigh.	Other Regions.	Total.
1847	1,583,374	67,457	106,401	643,973	687,505	2,982,309
1848	1,652,835	61,530	162,626	660,746	694,127	3,089,238
Tons	69,459		56,225	36,773	6,622	1,096,929

COMPARATIVE TABLE OF WEIGHTS AND MEASURES.

The NEWCASTLE STATUTE COAL MEASURE converted into WEIGHT.

Chals.	Tons.	Cwt.	Chals.	Tons.	Cwt.	Chals.	Tons.	Cwt.	Chals.	Tons.	Cwt.
1	2	13	39	103	7	77	204	1	114	302	2
2	5	6	40	106	0	78	206	14	115	304	15
3	7	19	41	108	13	79	209	7	116	307	8
4	10	12	42	111	6	80	212	0	117	310	1
5	13	5	43	113	19	81	214	13	118	312	14
6	15	18	44	116	12	82	217	6	119	315	7
7	18	11	45	119	5	83	219	19	120	318	0
8	21	4	46	121	18	84	222	12	121	320	13
9	23	17	47	124	11	85	225	5	122	323	6
10	26	10	48	127	4	86	227	18	123	325	19
11	29	3	49	129	17	87	230	11	124	328	12
12	31	16	50	132	10	88	233	4	125	331	5
13	34	9	51	135	3	89	235	17	126	333	18
14	37	2	52	137	16	90	238	10	127	336	11
15	39	15	53	140	9	91	241	3	128	339	4
16	42	8	54	143	2	92	243	16	129	341	17
17	45	1	55	145	15	93	246	9	130	344	10
18	47	14	56	148	8	94	249	2	131	347	3
19	50	7	57	151	1	95	251	15	132	349	16
20	53	0	58	153	14	96	254	8	133	352	9
21	55	13	59	156	7	97	257	1	134	355	2
22	58	6	60	159	0	98	259	14	135	357	15
23	60	19	61	161	13	99	262	7	136	360	8
24	63	12	62	164	6	100	265	0	137	363	1
25	66	5	63	166	19	101	267	13	138	365	14
26	68	18	64	169	12	102	270	6	139	368	7
27	71	11	65	172	5	103	272	19	140	371	0
28	74	4	66	174	18	104	275	12	141	373	13
29	76	17	67	177	11	105	278	5	142	376	6
30	79	10	68	180	4	106	280	18	143	378	19
31	82	3	69	182	17	107	283	11	144	381	12
32	84	16	70	185	10	108	286	4	145	384	5
33	87	9	71	188	3	109	288	17	146	386	18
34	90	2	72	190	16	110	291	10	147	389	11
35	92	15	73	193	9	111	294	3	148	392	4
36	95	8	74	196	2	112	296	16	149	394	17
37	98	1	75	198	15	113	299	9	150	397	10
38	100	14	76	201	8						

The London Imperial Coal Measure converted into Weight.

Chals.	Tons.	Cwt.	Chals.	Tons.	Cwt.	Chals.	Tons.	Cwt.	Chals.	Tons.	Cwt.
1	1	5½	51	65	0½	101	128	15½	151	192	10½
2	2	11	52	66	6	102	130	1	152	193	16
3	3	16½	53	67	11½	103	131	6½	153	195	1½
4	5	2	54	68	17	104	132	12	154	196	7
5	6	7½	55	70	2½	105	133	17½	155	197	12½
6	7	13	56	71	8	106	135	3	156	198	18
7	8	18½	57	72	13½	107	136	8½	157	200	3½
8	10	4	58	73	19	108	137	14	158	201	9
9	11	9½	59	75	4½	109	138	19½	159	202	14½
10	12	15	60	76	10	110	140	5	160	204	0
11	14	0½	61	77	15½	111	141	10½	161	205	5½
12	15	6	62	79	1	112	142	16	162	206	11
13	16	11½	63	80	6½	113	144	1½	163	207	16½
14	17	17	64	81	12	114	145	7	164	209	2
15	19	2½	65	82	17½	115	146	12½	165	210	7½
16	20	8	66	84	3	116	147	18	166	211	13
17	21	13½	67	85	8½	117	149	3½	167	212	18½
18	22	19	68	86	14	118	150	9	168	214	4
19	24	4½	69	87	19½	119	151	14½	169	215	9½
20	25	10	70	89	5	120	153	0	170	216	15
21	26	15½	71	90	10½	121	154	5½	171	218	0½
22	28	1	72	91	16	122	155	11	172	219	6
23	29	6½	73	93	1½	123	156	16½	173	220	11½
24	30	12	74	94	7	124	158	2	174	221	17
25	31	17½	75	95	12½	125	159	7½	175	223	2½
26	33	3	76	96	18	126	160	13	176	224	8
27	34	8½	77	98	3½	127	161	18½	177	225	13½
28	35	14	78	99	9	128	163	4	178	226	19
29	36	19½	79	100	14½	129	164	9½	179	228	4½
30	38	5	80	102	0	130	165	15	180	229	10
31	39	10½	81	103	5½	131	167	0½	181	230	15½
32	40	16	82	104	11	132	168	6	182	232	1
33	42	1½	83	105	16½	133	169	11½	183	233	6½
34	43	7	84	107	2	134	170	17	184	234	12
35	44	12½	85	108	7½	135	172	2½	185	235	17½
36	45	18	86	109	13	136	173	8	186	237	3
37	47	3½	87	110	18½	137	174	13½	187	238	8½
38	48	9	88	112	4	138	175	19	188	239	14
39	49	14½	89	113	9½	139	177	4½	189	240	19½
40	51	0	90	114	15	140	178	10	190	242	5
41	52	5½	91	116	0½	141	179	15½	191	243	10½
42	53	11	92	117	6	142	181	1	192	244	16
43	54	16½	93	118	11½	143	182	6½	193	246	1½
44	56	2	94	119	17	144	183	12	194	247	7
45	57	7½	95	121	2½	145	184	17½	195	248	12½
46	58	13	96	122	8	146	186	3	196	249	18
47	59	18½	97	123	13½	147	187	8½	197	251	3½
48	61	4	98	124	19	148	188	14	198	252	9
49	62	9½	99	126	4½	149	189	19½	199	253	14½
50	63	15	100	127	10	150	191	5	200	255	0

RELATIVE PRICES OF COALS.

The Ton, 20 cwt.						The Imperial Chaldron, 25½ cwt.						The Newcastle Chaldron, 53 cwt.					
℔ Ton.		℔ Imp.Chal.		℔New.Chal.		℔Ton.		℔Imp. Chal.		℔New.Chal.		℔Ton.		℔Imp. Chal.		℔New.Chal.	
s.	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*
1	0	1	3·30	2	7·80	8	6	10	10·05	22	6·30	16	0	20	4·80	42	4·80	23	6	29	11·55	62	3·30
1	3	1	7·12	3	3·75	8	9	11	1·87	23	2·25	16	3	20	8·62	43	0·75	23	9	30	3·37	62	11·25
1	6	1	10·95	3	11·70	9	0	11	5·70	23	10·20	16	6	21	0·45	43	8·70	24	0	30	7·20	63	7·20
1	9	2	2·77	4	7·65	9	3	11	9·52	24	6·15	16	9	21	4·27	44	4·65	24	3	30	11·02	64	3·15
2	0	2	6·60	5	3·60	9	6	12	1·35	25	2·10	17	0	21	8·10	45	0·60	24	6	31	2·85	64	11·10
2	3	2	10·42	5	11·55	9	9	12	5·17	25	10·05	17	3	21	11·92	45	8·55	24	9	31	6·67	65	7·05
2	6	3	2·25	6	7·50	10	0	12	9·00	26	6·00	17	6	22	3·75	46	4·50	25	0	31	10·50	66	3·00
2	9	3	6·07	7	3·45	10	3	13	0·82	27	1·95	17	9	22	7·57	47	0·45	25	3	32	2·32	66	10·95
3	0	3	9·90	7	11·40	10	6	13	4·65	27	9·90	18	0	22	11·40	47	8·40	25	6	32	6·15	67	6·90
3	3	4	1·72	8	7·35	10	9	13	8·47	28	5·85	18	3	23	3·22	48	4 35	25	9	32	9·97	68	2·85
3	6	4	5·55	9	3·30	11	0	14	0·30	29	1·80	18	6	23	7·05	49	0·30	26	0	33	1·80	68	10·80
3	9	4	9·37	9	11·25	11	3	14	4·12	29	9·75	18	9	23	10·87	49	8·25	26	3	33	5·62	69	6·75
4	0	5	1·20	10	7·20	11	6	14	7·95	30	5·70	19	0	24	2·70	50	4·20	26	6	33	9·45	70	2·70
4	3	5	5·02	11	3·15	11	9	14	11·77	31	1·65	19	3	24	6·52	51	0·15	26	9	34	1·27	70	10·65
4	6	5	8·85	11	11·10	12	0	15	3·60	31	9·60	19	6	24	10·35	51	8·10	27	0	34	5·10	71	6·60
4	9	6	0·67	12	7·05	12	3	15	7·42	32	5·55	19	9	25	2·17	52	4·05	27	3	34	8·92	72	2·55
5	0	6	4·50	13	3·00	12	6	15	11·25	33	1·50	20	0	25	6·00	53	0·00	27	6	35	0·75	72	10·50
5	3	6	8·32	13	10·95	12	9	16	3·07	33	9·45	20	3	25	9·82	53	7·95	27	9	35	4·57	73	6·45
5	6	7	0·15	14	6·90	13	0	16	6·90	34	5·40	20	6	26	1·65	54	3·90	28	0	35	8·40	74	2·40
5	9	7	3·97	15	2·85	13	3	16	10·72	35	1·35	20	9	26	5·47	54	11·85	28	3	36	0·22	74	10·35
6	0	7	7·80	15	10·80	13	6	17	2·55	35	9·30	21	0	26	9·30	55	7·80	28	6	36	4·05	75	6·30
6	3	7	11·62	16	6·75	13	9	17	6·37	36	5·25	21	3	27	1·12	56	3·75	28	9	36	7·87	76	2·25
6	6	8	3·45	17	2·70	14	0	17	10·20	37	1·20	21	6	27	4·95	56	11·70	29	0	36	11·70	76	10·20
6	9	8	7·27	17	10·65	14	3	18	2·02	37	9·15	21	9	27	8·77	57	7·65	29	3	37	3.52	77	6·15
7	0	8	11·10	18	6·60	14	6	18	5·85	38	5·10	22	0	28	0·60	58	3·60	29	6	37	7·35	78	2·10
7	3	9	2·92	19	2·55	14	9	18	9·67	39	1·05	22	3	28	4·42	58	11·55	29	9	37	11·17	78	10·05
7	6	9	6·75	19	10·50	15	0	19	1·50	39	9·00	22	6	28	8·25	59	7·50	30	0	38	3·00	79	6·00
7	9	9	10·57	20	6·45	15	3	19	5·32	40	4·95	22	9	29	0·07	60	3·45	30	3	38	6·82	80	1·95
8	0	10	2·40	21	2·40	15	6	19	9·15	41	0·90	23	0	29	3·90	60	11·40	30	6	38	10·65	80	9·90
8	3	10	6·22	21	10·35	15	9	20	0·97	41	8·85	23	3	29	7·72	61	7·35	30	9	39	2·47	81	8·55

STANDARD PRODUCE and PRICE.

The Standard not being generally understood, or the rule whereby the price of ore, of a given produce sold at a certain standard, can be ascertained, as well as the standard at which ore sells, the produce and price of which are given, we are induced to give the following form, which is in itself so simple as to require no explanatory remarks.

Question 1.—What is the price per Ton of Copper Ore the produce of which by assay is $8\frac{3}{4}$, at the Standard of £94 8 0?

		£94	8	0
				$8\frac{3}{4}$
		755	4	0
$\frac{1}{2}$	—	47	4	0
$\frac{1}{4}$	—	33	12	0
		8,36	0	0
		20		
		7,20		
		12		
		2,40		

From	£8	7	2
Deduct retaining charges	2	15	0
	£5	8	2 the price per Ton.

Question 2.—What is the Standard at which Ore sells, the price being £5 17 per Ton, and the produce $9\frac{1}{4}$?

To the price	£5	17	6			
Add retaining charges ..	2	15	0			
	£8	12	6			

$9\frac{1}{4}$: £8 12 6 :: 100

4 20 4

37 172 400

12

2070

400

37)828000(22378

827986

14

12) 22378

20) 186,4 10

£93 4 $10\frac{1}{37}$

TABLE of GRADIENTS.

Rise		Inclination.	Rise		Inclination.	Rise		Inclination.
Per mile.	Per chain.		Per mile.	Per chain.		Per mile.	Per chain.	
ft.	in.	1 in.	ft.	in.	1 in.	ft.	in.	1 in.
1	·15	5280	21	3·15	251·4	41	6·15	128·8
2	·30	2640	22	3·30	240	42	6·30	125·7
3	·45	1760	23	3·45	229·5	43	6·45	122·8
4	·60	1320	24	3·60	220	44	6·60	120
5	·75	1056	25	3·75	211·2	45	6·75	117·3
6	·90	880	26	3·90	203·1	46	6·90	114·8
7	1·05	754·2	27	4·05	195·5	47	7·05	112·3
8	1·20	660	28	4·20	188·6	48	7·20	110
9	1·35	586·6	29	4·35	182·1	49	7·35	107·7
10	1·50	528	30	4·50	176	50	7·50	105·6
11	1·65	480	31	4·65	170·3	51	7·65	103·5
12	1·80	440	32	4·80	165	52	7·80	101·5
13	1·95	406·1	33	4·95	160	53	7·95	99·6
14	2·10	377·1	34	5·10	155·3	54	8·10	97·8
15	2·25	352	35	5·25	150·8	55	8·25	96
16	2·40	330	36	5·40	146·6	56	8·40	94·3
17	2·55	310·6	37	5·55	142·7	57	8·55	92·6
18	2·70	293·3	38	5·70	138·9	58	8·70	91
19	2·85	277·9	39	5·85	135·4	59	8·85	89·5
20	3·00	264	40	6·00	132	60	9·00	88

MAGNETIC DECLINATION, or VARIATION of the COMPASS.

Within the last year two volumes of the Greenwich Magnetical and Meteorological Observations for the years 1845 and 1846 have been published, from which it appears that the following were the monthly values of the westerly declination, deduced from two-hourly observations made during the day and night, in the years 1845 and 1846.

1845.		1846.	
January	22° 59′ 6″	January	22° 50′ 56″
February	22 57 20	February	22 50 17
March	22 57 6	March	22 49 21
April	22 59 14	April	22 51 51
May	22 57 28	May	22 49 32
June	23 1 10	June	22 51 48
July	22 57 24	July	22 49 24
August	22 58 11	August	22 49 33
September	22 56 7	September	22 48 55
October	22 53 21	October	22 47 55
November	22 52 53	November	22 47 38
December	22 52 18	December	22 47 51

The mean westerly declination for the year 1845 was 22° 56′ 43″, and that for the year 1846 was 22° 49′ 35″. The decrease from the year 1844 to 1845 was 18′ 36″; and that from the year 1845 to 1846 was 7′ 9″.

STONE QUARRIES.

Quarry, and where situate.	Colour.	Weight per cubic foot.
NATURE OR COMPONENT PARTS.		
Sandstone, chiefly quartz and silex.		lbs.
Abercarne, Newport, Monmouthshire	Dark bluish grey.	168
Aislaby, Whitby, Yorkshire	Light brown.	136½
Binnie, Uphall, Linlithgowshire	Brownish grey.	140
Bramley Fall, Leeds, Yorkshire	Light brown.	142½
Craigleith, Bed Rock, near Edinburgh	Whitish grey.	146
Darley Dale, Bakewell, Derbyshire	Light brown.	148½
Duke's Quarries, Cromford, Derbyshire	Purplish green variegt.	144½
Giffnock, Glasgow, Lanarkshire	Pale grey.	144
Glammis, Forfar, Forfarshire	Purple grey.	161
Heddon, Newcastle-on-Tyne	Light brown.	136½
Hollington, Uttoxeter	Brownish grey.	133
Longannet, Perthshire	Light brown.	131½
Munlochy, Ross-shire	Red and variegated.	166½
Mylnefield, Dundee	Purplish grey.	166
Park Spring, Leeds	Light brown.	131
Rock Valley, Mansfield, Nottinghamshire	Brick red.	148½
Scotgate Head, Huddersfield	Greenish grey.	158
Limestone, chiefly carbonate of lime.		
Ancaster, Sleaford, Lincolnshire	Cream colour.	139½
Barnack Mill, Stamford	Whitish brown.	136½
Box Hill, Chippenham, Wiltshire	Cream.	123
Chilmark, Salisbury	Greenish brown.	153½
Doulting, Shepton Mallet	Light brown.	134½
Ham Hill, Yeovil, Somersetshire	Deep ferr. brown.	141½
Hopton Wood, Worksworth, Derbyshire	Light grey.	158½
Ketton, Stamford, Rutlandshire	Dark cream.	128½
Portland (Grove Quarry), Weymouth	Whitish brown.	147½
Portland (Waycroft Quarry), Weymouth	Ditto.	135½
Purbeck, Corfe Castle, Dorset	Light brown.	151
Sutton, Bridgend, Glamorganshire	Light cream.	136
Taynton, Burford, Oxfordshire	Streaky brown.	136
Magnesian Limestone, chiefly carbonates of lime and magnesia.		
Bolsover, Chesterfield	Yellowish brown.	151½
Brodsworth, Doncaster	Light brown.	133½
Huddlestone, Sherburne, Yorkshire	Whitish cream.	137½
Mansfield-Woodhouse, Mansfield	Yellowish brown.	145½
North Auston, Rotherham	Ditto.	144
Roche Abbey, Bawtry, Yorkshire	Whitish cream.	139
Smawse Hall, Tadcaster, Yorkshire	Light yellowish brown.	127½

24 cubic feet of sand, 17 ditto clay, 18 ditto earth, 13 ditto chalk, equal 1 ton.

1 cubic yard of earth before digging will occupy about 1¼ cubic yards when dug, and contains 21 striked bushels, which is considered a *single load*, and double these quantities a *double load*.

COMMERCIAL PROGRESS in SOUTH AUSTRALIA.

The following statistical data show the rapid increase in the commercial transactions of the above colony, only first trodden by a small body of British colonists in 1836, and certainly not established until two years later:—

	Imports.	Exports.	Value of copper ore.
1843	£109,000	£81,000	—
1844	119,000	95,000	£4,009
1845	185,000	148,000	17,179
1846	330,000	313,000	54,168
1847	380,910	304,591	171,883

INTEREST from £1 to £500, at FIVE PER CENT.

	1 Day.	2 Days.	3 Days.	4 Days.	5 Days.	10 Days.	20 Days.	30 Days.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	£ s. d.	£ s. d.
1	0 0	0 0	0 0	0 0	0 0	0 0½	0 0 0½	0 0 0½
2	0 0	0 0	0 0	0 0½	0 0½	0 0½	0 0 1½	0 0 1½
3	0 0	0 0	0 0½	0 0½	0 0½	0 0½	0 0 1½	0 0 2½
4	0 0	0 0½	0 0½	0 0½	0 0½	0 1½	0 0 2½	0 0 3½
5	0 0	0 0½	0 0½	0 0½	0 0½	0 1½	0 0 3½	0 0 4½
6	0 0	0 0½	0 0½	0 0½	0 0½	0 1½	0 0 3½	0 0 5½
7	0 0	0 0½	0 0½	0 0½	0 1	0 2½	0 0 4½	0 0 6½
8	0 0½	0 0½	0 0½	0 1	0 1½	0 2½	0 0 5½	0 0 7½
9	0 0½	0 0½	0 0½	0 1	0 1½	0 2½	0 0 5½	0 0 8½
10	0 0½	0 0½	0 0½	0 1½	0 1½	0 3½	0 0 6½	0 0 9½
20	0 0½	0 1½	0 1½	0 2½	0 3½	0 6½	0 1 1	0 1 7½
30	0 0½	0 1½	0 2½	0 3½	0 4½	0 9½	0 1 7½	0 2 5½
40	0 1½	0 2½	0 3½	0 5½	0 6½	1 1	0 2 2½	0 3 3½
50	0 1½	0 3½	0 4½	0 6½	0 8	1 4½	0 2 8½	0 4 1½
60	0 1½	0 3½	0 5½	0 7½	0 9½	1 7½	0 3 3½	0 4 11
70	0 2½	0 4½	0 6½	0 9	0 11½	1 11	0 3 10	0 5 9
80	0 2½	0 5½	0 7½	0 10½	1 1	2 2½	0 4 4½	0 6 6½
90	0 2½	0 5½	0 8½	0 11½	1 2½	2 5½	0 4 11	0 7 4½
100	0 3½	0 6½	0 9½	1 1	1 4½	2 8½	0 5 5½	0 8 2½
200	0 6½	1 1	1 7½	2 2½	2 8½	5 5½	0 10 11½	0 16 5½
300	0 9½	1 7½	2 5½	3 3½	4 1½	8 2½	0 16 5½	1 4 7½
400	1 1	2 2½	3 3½	4 4½	5 5½	10 11½	1 1 11	1 12 10½
500	1 4½	2 8½	4 1½	5 5½	6 10	13 8½	1 7 4½	2 1 1

INTEREST from £1 to £500, at FIVE PER CENT.

	1 Mon.	2 Mon.	3 Mon.	4 Mon.	5 Mon.	6 Mon.	9 Mon.	12 Mon.
	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
1	0 0 1	0 0 2	0 0 3	0 0 4	0 0 5	0 0 6	0 0 9	0 1 0
2	0 0 2	0 0 4	0 0 6	0 0 8	0 0 10	0 1 0	0 1 6	0 2 0
3	0 0 3	0 0 6	0 0 9	0 1 0	0 1 3	0 1 6	0 2 3	0 3 0
4	0 0 4	0 0 8	0 1 0	0 1 4	0 1 8	0 2 0	0 3 0	0 4 0
5	0 0 5	0 0 10	0 1 3	0 1 8	0 2 1	0 2 6	0 3 9	0 5 0
6	0 0 6	0 1 0	0 1 6	0 2 0	0 2 6	0 3 0	0 4 6	0 6 0
7	0 0 7	0 1 2	0 1 9	0 2 4	0 2 11	0 3 6	0 5 3	0 7 0
8	0 0 8	0 1 4	0 2 0	0 2 8	0 3 4	0 4 0	0 6 0	0 8 0
9	0 0 9	0 1 6	0 2 3	0 3 0	0 3 9	0 4 6	0 6 9	0 9 0
10	0 0 10	0 1 8	0 2 6	0 3 4	0 4 2	0 5 0	0 7 6	0 10 0
20	0 1 8	0 3 4	0 5 0	0 6 8	0 8 4	0 10 0	0 15 0	1 0 0
30	0 2 6	0 5 0	0 7 6	0 10 0	0 12 6	0 15 0	1 2 6	1 10 0
40	0 3 4	0 6 8	0 10 0	0 13 4	0 16 8	1 0 0	1 10 0	2 0 0
50	0 4 2	0 8 4	0 12 6	0 16 8	1 0 10	1 5 0	1 17 6	2 10 0
60	0 5 0	0 10 0	0 15 0	1 0 0	1 5 0	1 10 0	2 5 0	3 0 0
70	0 5 10	0 11 8	0 17 6	1 3 4	1 9 2	1 15 0	2 12 6	3 10 0
80	0 6 8	0 13 4	1 0 0	1 6 8	1 13 4	2 0 0	3 0 0	4 0 0
90	0 7 6	0 15 0	1 2 6	1 10 0	1 17 6	2 5 0	3 7 6	4 10 0
100	0 8 4	0 16 8	1 5 0	1 13 4	2 1 8	2 10 0	3 15 0	5 0 0
200	0 16 8	1 13 4	2 10 0	3 6 8	4 3 4	5 0 0	7 10 0	10 0 0
300	1 5 0	2 10 0	3 15 0	5 0 0	6 5 0	7 10 0	11 5 0	15 0 0
400	1 13 4	3 6 8	5 0 0	6 13 4	8 6 8	10 0 0	15 0 0	20 0 0
500	2 1 8	4 3 4	6 5 0	8 6 8	10 8 4	12 10 0	18 15 0	25 0 0

CURRENT COINS.

GREAT BRITAIN.

Gold.

	dwt.	grs.	£	s.	d.
Double sovereign ..	10	6½	2	0	0
Sovereign	5	3¼	1	0	0
Half-sovereign ..	2	13½	0	10	0

Silver.

Crown	18	4½	0	5	0
Half-crown	9	2	0	2	6
Shilling	3	15½	0	1	0
Sixpence	1	19½	0	0	6
Fourpence	1	5	0	0	4

Note.—The standard for gold coin in Great Britain is a mixture of eleven parts fine gold and one of alloy, 1 lb. troy of which is coined into 46 sovereigns and $\frac{11}{116}$ of another.

The standard for silver coin is a mixture of thirty-seven parts of fine silver and three of alloy, 1 lb. troy of which is coined into 66 shillings.

FRANCE.

Gold.

	dwt.	grs.	£	s.	d.
40 Franc piece ..	8	7	1	11	8½
20 do. ..	4	3½	0	15	10½

Silver.

5 Franc piece ..	16	1	0	4	0
2 do. ..	6	11	0	1	7
1 do. ..	3	5½	0	0	9½
½ or 50 centimes ..	1	15	0	0	4½
¼ or 25 do	0	18½	0	0	2¼

HAMBURGH.

Gold.

Ducat of 6½ marks ..	2	5¾	0	9	4

Silver.

Rix-doll. or 3 marks	18	18	0	4	7
Mark, or 16 shillings	5	20	0	1	2½

HOLLAND.

Gold.

20 Florin piece ..	9	7½	1	14	2½
Ryder	6	10½	1	5	1½
10 Florin piece ..	4	15	0	17	1
10 Williams, 1818 ..	7	7½	0	16	5½

Silver.

Ducaton	20	22	0	5	5
Ducat or rix-dollar	18	6	0	4	4
Florin	6	22	0	1	8½
Escalin	3	4	0	0	6

SPAIN.

Gold.

Doubloon of 8 crowns	17	9	3	4	8
Do. 4 do.	8	16½	1	12	4
Do. 2 do.	4	8¼	0	16	2
Half pistole, or crown	2	4	0	8	1

Silver.

Piastre	17	8	0	4	3¾
Peseta	3	18	0	0	10½
Half do.	1	21	0	0	5¼
Reallillo	0	22½	0	0	2¼

PORTUGAL.

Gold.

Moidore of 4,800 reis	6	22	1	6	11½
Half do.	3	11	0	13	5¼
Quarter do.	1	17½	0	6	8¾
Moiadobra	9	5	1	15	11
Half do.	4	14	0	17	10½
16 Testons	2	7	0	8	11
12 do.	1	17½	0	6	4½
8 do.	1	3½	0	4	5¾
Cruzada	0	16½	0	2	7¼

Silver.

New cruzada of 480 reis	9	1	0	4	11

RUSSIA.

Gold.

Ducat of 1763 ..	2	5¾	0	9	2½
Imperial of 10 rubles	7	17½	1	12	9
Half do.	3	20½	0	16	4½

Silver.

Ruble of 100 copecks	15	10	0	3	2

PRUSSIA.

Gold.

Frederic d'or ..	4	7	0	16	6
Half do.	2	3½	0	8	3
Ducat	2	5¾	0	9	4

Silver.

Rix-dollar	14	6½	0	2	11½
5 Groschen	2	9	0	0	5¾
Groscher			0	0	1¼

SWEDEN.

Gold.

Ducat	2	5	0	9	3¼
Half do.	1	2½	0	4	7¾
Quarter do.	0	13¼	0	2	3¾

Silver.

Rix-dollar	18	17	0	4	6
Two-thirds do. ..	12	11	0	3	0
One-third do. ..	6	5	0	1	6

AMERICA (UNITED STATES).

Gold.

Eagle of 10 dollars ..	11	6	2	3	10
Half-eagle of 5 do...	5	15	1	1	11
Quar. eagle of 2½ do.	2	19½	0	10	11½

Silver.

Dollar or 100 cents.	17	5	0	4	3
Half-dollar, or 50 do.	8	14	0	2	1
Quar. dollar, or 25 do.	4	7	0	1	0

STATISTICS OF MINERALS AND METALS.

COPPER ORES SOLD in CORNWALL from 1729 to 1832.

Year.	Copper Ore. Tons.	Copper. Tons. cwt. qr. lb.	Amount. £ s. d.	Produce.	Standard. £ s. d.
1729	2,216	—	—	—	—
1730	2,832	—	—	—	—
1731	2,556	—	—	—	—
1732	1,714	—	—	—	—
1733	2,113	—	—	—	—
1764	16,437	1,869 4 3 15	—	11⅜	—
1765	18,425	2,089 6 3 14	—	11⅜	—
1766	21,776	2,520 13 2 27	—	11¼	—
1767	19,636	2,016 3 0 22	—	10⅝	—
1768	23,684	2,555 17 1 6	—	10½	—
1769	26,353	2,706 15 3 0	—	10¼	—
1770	31,758	3,267 9 2 13	—	10¼	—
1771	28,091	3,073 7 1 25	—	20⅞	—
1772	27,015	3,060 18 2 25	—	11¼	—
1773	27,654	3,152 1 0 24	—	11	—

[The intervals from 1733 to 1764, and from 1773 to 1800, cannot be obtained.]

1800	55,981	5,187 0 3 7	550,925 1 0	9½	133 3 0
1801	56,611	6,267 18 3 10	476,313 1 0	9½	117 5 0
1802	53,937	5,228 15 3 5	445,094 4 0	9⅜	110 18 0
1803	60,566	5,615 16 0 21	533,910 16 0	9½	122 0 0
1804	64,637	5,374 18 1 20	570,840 11 0	8⅝	136 5 0
1805	78,452	6,234 5 0 6	862,410 16 0	7⅞	169 16 0
1806	79,269	6,863 10 2 13	730,845 6 6	8⅛	138 5 0
1807	71,694	6,716 12 1 26	609,002 13 0	9⅛	120 0 0
1808	67,867	6,795 13 2 25	495,303 1 6	10	100 7 0
1809	76,245	6,821 13 1 19	770,028 15 6	8⅞	143 12 0
1810	66,048	5,662 19 1 27	570,035 8 0	8⅛	132 5 0
1811	66,786	6,141 13 3 7	556,723 19 0	9⅛	120 12 0
1812	71,547	6,730 7 2 4	549,665 6 6	9⅜	111 1 0
1813	74,047	6,918 3 0 6	594,345 10 0	9¼	115 7 0
1814	74,322	6,369 13 3 7	627,501 10 0	8½	130 12 0
1815	78,483	6,525 6 3 25	552,813 8 6	8¼	117 16 0
1816	77,334	6,697 4 0 17	447,959 17 0	8⅛	98 13 0
1817	76,701	6,498 2 0 16	494,010 12 6	8½	108 10 0
1818	86,174	6,849 7 1 1	686,005 4 8	7⅞	134 15 0
1819	88,736	6,804 2 2 7	623,595 4 6	7⅞	127 10 0
1820	91,473	7,508 0 3 26	602,441 12 0	8⅛	113 15 0
1821	98,426	8,514 19 2 12	605,968 19 8	8⅛	103 0 0
1822	100,364	8,569 18 3 10	638,715 9 6	8⅛	106 14 0
1823	97,017	7,730 2 1 7	605,083 1 8	8	112 16 0
1824	103,710	8,004 9 2 19	636,741 2 11	7⅞	115 13 0
1825	110,964	8,468 6 1 20	820,215 13 11	7⅞	132 17 0
1826	122,846	9 767 17 2 3	708,268 11 7	8	107 0 0
1827	131,876	10,440 2 0 7	783,818 16 6	7⅞	109 16 0
1828	124,272	9,447 8 0 8	714,992 10 6	7⅞	112 0 0
1829	130,449	10,292 13 2 18	754,904 0 0	7⅞	108 10 0
1830	141,263	11,554 18 0 5	802,979 9 0	8⅛	103 2 0
1831	137,893	11,836 9 0 7	798,308 5 6	8⅛	99 9 0
1832	136,719	11,491 13 3 12	833,131 17 0	8⅛	105 4 0

From this period the returns are compiled from "Gryll's Annual Mining Sheet," and are made up to the 30th of June in each year, as shown in the following Tables.

AN ACCOUNT of the Sales, by Public Ticketings, of British and Foreign Copper Ores in Cornwall and Swansea respectively, in each year, from the 30th June, 1832, to the 30th June, 1848, showing the Averages of the per-centage of produce in metal, prices, computed quantities of fine Copper in the Ore, and Value in Money; with General Averages for the whole period, and the Total Produce in Metal, and Money Value of the whole. Also giving the Value of Ore computed to produce a Ton of Copper, from the entire Sales, and from those of Cornwall and Swansea respectively.

In the Years ending	CORNWALL.					SWANSEA.					CORNWALL and SWANSEA Average.				
	Computed quantity of ore in tons of 21 cwt.	Average produce per cent.	Computed quantity of fine copper.	Average price of ore per ton of 21 cwt.	Total value in money.	Computed quantity of ore, in tons of 21 cwt.	Average produce per cent.	Computed quantity of fine copper.	Average price of ore per ton of 21 cwt.	Total value in money.	Total produce of the whole in fine copper.	Total value of the whole in money.	Average value of the quantity of ore to make a ton of copper.	Average value of Cornish ore to make a ton of copper.	Average value of Swansea ore to make a ton of copper.
	Tons.		Tons.	£ s. d.	£	Tons.		Tons.	£ s. d.	£	Tons.	£	£ s. d.	£ s. d.	£ s. d.
30th June, 1833	138,300	8	11,185	6 1 6	858,709	13,101	8¾	1,158	7 5 0	95,008	12,343	953,717	77 5 4	76 15 5	82 0 10
1834	143,296	7¾	11,225	6 4 0	887,902	18,112	8¼	1,580	7 7 6	133,821	12,805	1,021,723	79 15 9	79 2 0	84 14 0
1835	150,617	8¼	12,272	5 18 6	893,403	28,771	9⅞	2,833	7 15 6	223,990	15,105	1,117,393	73 19 5	72 15 10	79 1 3
1836	140,981	8¼	11,640	6 17 0	957,752	34,366	11¼	3,849	9 17 6	340,025	15,489	1,297,777	83 15 8	82 5 7	88 6 9
1837	140,753	7⅞	10,823	6 9 1	918,614	34,216	11⅛	3,960	9 18 0	338,976	14,783	1,257,590	85 1 4	84 17 6	85 12 0
1838	145,688	7⅞	11,537	5 17 6	857,780	42,931	13⅜	5,906	11 4 6	481,323	17,433	1,339,103	76 16 3	74 8 3	81 9 11
1839	159,551	7½	12,461	5 17 0	932,298	49,474	14½	7,296	12 1 6	597,996	19,747	1,530,294	77 9 10	74 1 5	81 19 3
1840	147,266	7⅛	11,038	5 7 6	792,758	56,279	15	8,473	11 19 6	674,012	19,511	1,466,770	75 3 6	71 16 5	79 10 11
1841	135,090	7⅜	9,987	6 1 6	819,949	59,378	17⅛	10,290	14 14 6	871,248	20,277	1,691,197	83 8 1	82 2 0	84 13 4
1842	135,581	7 3/16	9,896	6 1 6	822,871	56,821	16⅜	9,378	14 5 0	808,182	19,274	1,631,053	84 12 5	83 3 0	86 3 7
1843	144,806	7 3/16	10,926	5 11 0	804,446	60,554	16½	9,862	13 6 0	805,213	20,788	1,609,659	77 8 8	73 12 7	81 13 0
1844	152,667	7⅜	11,247	5 6 10	815,246	65,520	16 9/16	11,108	13 9 4	882,568	22,355	1,697,814	75 18 9	72 12 3	79 9 0
1845	157,000	7½	12,239	5 6 3	835,351	62,950	16 7/16	10,349	12 1 5	750,999	22,588	1,586,350	70 12 6	68 5 0	73 8 10
1846	158,913	7 15/16	12,448	5 11 7	886,785	64,987	15 5/16	9,788	11 10 6	748,915	22,236	1,635,700	73 11 2	71 6 4	76 10 3
1847	148,674	8 1/16	11,966	5 11 9	830,739	53,284	16¼	8,857	12 13 9	676,069	20,823	1,506,808	72 7 3	69 8 6	76 6 7
1848	155,616	8¼	12,870	5 6 0	825,080	50,731	17	8,645	12 8 2	629,560	21,514	1,454,741	67 12 4	64 2 2	72 16 8
Total Amt. in 16 yrs.	2,354,799		183,740		13,739,683	751,475		113,332		9,067,905	297,071	22,806,589			
Averages pr. Annum	147,175	7·803	11,484	5 16 8	858,730	46,967	15·081	7,083	12 1 4	566,688	18,567	1,425,418	76 15 5	74 15 0	80 0 2

SALES of BRITISH COPPER ORES in CORNWALL and SWANSEA, in the Five Years ending 30th June, 1848; with the Quantities and Value of Ore sold, the Averages in each Year of Produce, Quantities of Fine Copper in the Ore, Prices per Ton, Value in Money, &c.

		Tons of 21 cwt.	Average Produce per cent.	Fine Copper.	Average Price of Ore.	Value.	Total Value.	Quantities of Ore.	Average Produce per cent.	Fine Copper.	Average Price.	Value of Ore to a Ton of Copper.
				Tons.	£ s. d.	£	£	Tons.		Tons.	£ s. d.	£ s. d.
1844	Sales in Cornwall	152,667	7⅜	11,247	5 6 10	815,246	952,090	173,251	7·588	12,968	5 9 11	73 8 4
	Sales at Swansea	20,584	8 363	1,721	6 13 0	136,844						
1845	Sales in Cornwall	157,000	7½	12,239	5 6 3	835,351	951,355	176,026	7·883	13,818	5 8 1	68 17 0
	Sales at Swansea	19,026	8·301	1,579	6 1 11	116,004						
1846	Sales in Cornwall	158,913	7⅛	12,448	5 11 7	886,785	1,002,329	177,142	7·922	13,958	5 13 2	71 16 2
	Sales at Swansea	18,229	8·282	1,510	6 6 9	115,544						
1847	Sales in Cornwall	148,674	8⅛	11,966	5 11 9	830,739	921,879	163,571	8·134	13,160	5 12 9	70 1 0
	Sales at Swansea	14,897	8·015	1,194	6 2 4	91,140						
1848	Sales in Cornwall	155,616	8¼	12,870	5 6 0	825,080	921,019	170,238	8·438	14,364	5 8 2	64 2 5
	Sales at Swansea	14,622	10·215	1,494	6 11 3	95,939						
	Total Quantities	860,228		68,268			4,748,672	860,228		68,268		
	Average Amounts, &c...						949,734	172,046	7·936	13,654	5 10 5	69 11 2

SALES of FOREIGN COPPER ORES at SWANSEA, in the Five Years ending 30th June, 1848; with the Quantities and Value of Ore sold, the Averages in each Year of Produce in Metal, Quantities of Fine Copper in the Ore, Prices per Ton, Value in Money, &c.

		Tons of 21 cwt.	Average Produce per cent.	Fine Copper.	Average Price of Ore.	Value.	Total Value.	Quantities of Ore.	Average Produce per cent.	Fine Copper.	Average Price.	Value of Ore to a Ton of Copper.
				Tons.	£ s. d.	£	£	Tons.		Tons.	£ s. d.	£ s. d.
1844	Total sales at Swansea..	65,520	16¼	11,108	13 9 4	882,568	745,724	44,936	20·872	9,387	16 11 11	79 8 11
	Less British ores	20,584	8·363	1,721	6 13 0	136,844						
1845	Total sales at Swansea..	62,950	16 7/8	10,349	12 1 5	759,999	643,995	43,924	19·967	8,770	14 13 3	73 3 3
	Less British ores	19,026	8·301	1,579	6 1 11	116,004						
1846	Total sales at Swansea..	64,987	15½	9,788	11 10 6	748,915	633,371	46,758	17·703	8,278	13 10 11	76 10 3
	Less British ores	18,229	8·282	1,510	6 6 9	115,544						
1847	Total sales at Swansea..	53,284	16¾	8,857	12 13 9	676,069	584,929	38,387	19·834	7,663	15 4 9	76 6 8
	Less British ores	14,897	8·015	1,194	6 2 4	91,140						
1848	Total sales at Swansea..	50,731	17	8,645	12 8 2	629,660	533,721	36,109	19·804	7,151	14 15 7	74 12 9
	Less British ores	14,622	10·215	1,494	6 11 3	95,939						
	Total Quantities	210,114		41,249			3,141,740	210,114		41,249		
	Average Amounts, &c...						628,348	42,023	19·632	8,250	14 19 1	76 3 3

QUANTITIES of COPPER contained in Ores purchased by Smelters in Five Years ending 30th June, 1848; distinguishing those of British and Foreign production, and Quantities purchased at Ticketings, those imported by Smelters, or bought by Private Contract, with aggregate Value, &c.

		Copper produced from British Ores.			Copper produced from Foreign Ores.			Total Purchases.	From British Ores.	From Foreign Ores.	Total Value.
		Purchased at Ticketings in Cornwall & Swansea.	Purchased by Private Contract	Total British Ores.	Purchased at Ticketings at Swansea.	Imported and bought by Private Contract.	Total Foreign Ores.		Total Value of British Ores computed at Average Prices.	Total Value of Foreign Ores at Average Prices.	
		Copper Tons.	Copper Tons.	Copper Tons.	Copper Tons.	Copper Tons.	Coppe Tons	Copper Tons.	£	£	£
1844	.. ..	12,9?8	1,873	14,841	9,387	3,287	12,674	27,515	1,089,603	1,006,851	2,096,454
1845	.. ..	13,818	1,121	14,939	8,770	2,106	10,876	25,815	1,028,535	798,528	1,827,063
1846	.. ..	13,958	997	14,955	8,278	2,814	11,092	26,047	1,073,924	848,677	1,922,601
1847	.. ..	13,160	625	13,785	7,663	1,377	9,040	22,825	965,661	690,038	1,655,699
1848	.. ..	14,364	*356	14,720	7,151	*1,312	8,463	23,183	943,846	631,643	1,575,489
	Total Amounts..	68,268	4,972	73,240	41,249	10,896	52,145	125,385	5,101,569	3,975,737	9,077,306
	Average per Ann.	13,654	994	14,648	8,250	2,179	10,429	25,077	1,020,314	795,147	1,815,461

* The two quantities in the year ending 30th June, 1848, are not put forward as perfectly correct. The accounts for the four first years in this Table, and the first half of the year to Christmas, 1847, may be relied upon for accuracy; in the absence of similar accounts for the half-year ending Midsummer, 1848, the quantities of British and Foreign ores bought by Private Contract or imported during that period, are assumed to be the same as in the first half of the year.

RETURNS OF BRITISH AND FOREIGN MINES,

With comparative Produce and Price per Ton.

The returns made of the produce of British mines for the twelve months ending June, 1847, as compared with the returns of the produce of foreign mines, will give some idea of the richness of the latter when put in comparison with our own.

The following table we believe to be perfect, giving the produce of British mines, while the remarks appended will show the difference in value of home and foreign ores, the former say £4. 10*s.* per ton, and the latter £15. 5*s.*, or an excess as shown of 223 per cent.

No. of Mines.	Price per Ton.	No. of Tons.	Amount in Value.
			£
10	under £3	1,713	4,297
12	,, 4	9,123	32,025
29	,, 5	45,942	209,276
23	,, 6	30,558	165,748
15	,, 7	58,700	369,688
6	,, 8	15,477	115,642
1	,, 9	101	845
1	,, 10	84	774
2	above 10	1,873	23,584
99		163,571	£921,879

From the above statement, it will be seen that of the quantity raised about two-fifths of the mines produced 56,778 tons, or one-third the quantity, the value of which was £245,590, giving an average of £4. 6*s.* 6*d.* per ton; while the remaining three-fifths produced 87,336 tons, being upwards of half the entire quantity raised, yielding £411,338, or an average of £4. 14*s.* 2*d.*; thus showing that of the quantities of ore raised by two-thirds of the mines of which returns are given, the produce was little more than four-ninths in value.

On comparing these results with the price of the foreign ores for the like period, it will be found that the average of the latter was £15. 4*s.* 9*d.* per ton; which, if compared with that of British mines, the excess in favour of foreign is £10. 10*s.* 7*d.* per ton, or 223 per cent.

SALES of COPPER ORES in CORNWALL,

In the Quarter ending Dec. 31, 1848.

Date of Sale.	Average Standard.	Aver. Prod. per cent.	Average Price.	Quantity of Ore.	Computed quantity of fine copper	Amount of Sales.	Value of Ore to produce 1 ton of copper.
1848.	£ s. d.		£ s. d.	21 cwt.	Tons. cwt.	£ s. d.	£ s. d.
Oct. 5 ..	92 17 0	8¼	4 15 6	4,027	326 19	19,297 2 6	59 0 3
,, 12 ..	88 4 0	9¼	5 13 0	2,226	211 12	12,548 15 0	59 3 10
,, 19 ..	84 13 0	10¼	5 16 0	2,505	252 18	14,521 11 0	57 8 0
,, 26 ..	95 1 0	7¼	4 1 0	2,165	155 2	8,794 2 6	56 14 8
Nov. 2 ..	93 17 0	7¾	4 13 0	3,626	286 2	16,884 6 0	59 0 8
,, 9 ..	86 15 0	9¼	5 15 6	1,928	189 9	11,139 14 0	58 18 10
,, 23 ..	83 10 0	10¼	6 4 6	2,744	294 17	17,074 16 6	57 17 7
,, 30 ..	93 2 0	7¾	4 9 6	4,571	356 4	20,601 14 6	57 17 5
Dec. 7 ..	94 3 0	7¼	4 6 0	4,240	319 4	18,396 12 0	57 13 5
,, 14 ..	87 9 0	8¼	4 16 6	2,692	233 3	12,996 17 0	55 15 7
,, 21 ..	81 12 0	10¼	5 10 6	2,722	275 15	15,026 16 6	54 8 11
,, 28 ..	92 1 0	7¼	3 15 6	2,526	179 3	9,550 13 0	53 7 2
Totals for the quarter	89 7 1	8·564	4 18 4	35,972	3,060 8	176,833 0 6	57 8 3
Ditto for quarter to Mic. 1848 ..	86 3 3	8·412	4 10 0	39,026	3,283 0	175,698 16 6	53 9 10

COMPARATIVE RETURNS

For the Years ending 30th June in the Years 1846, 1847, and 1848.

	Average Standard.	Aver. Prod. per cent.	Average Price.	Quantity of Ore.	Computed quantity of fine copper	Amount of Sales.	Value of Ore to produce 1 ton of copper.
	£ s. d.		£ s. d.	21 cwt.	Tons. cwt.	£ s. d.	£ s. d.
1846	105 8 0	7·833	5 11 7	158,913	12,448 0	886,785 1 6	71 4 9
1847	103 12 0	8·049	5 11 9	143,674	11,966 0	830,739 9 0	69 8 6
1848	97 7 0	8·270	5 6 0	155,616	12,870 0	825,060 2 6	64 2 2

SALES of COPPER ORES at SWANSEA,

In the Quarter ending Dec. 31, 1848.

Ores sold.	Quantity.	Average Produce per cent.	Computed quantity of fine copper	Average Price.	Amount of Sales.	Value of Ore to produce 1 ton of copper.
	21 cwt.		Tons. cwt.	£ s. d.	£ s. d.	£ s. d.
FOREIGN ORES.						
Sold Oct. 5	1,495	19·250	295 7	11 4 7	18,360 15 0	61 13 2
,, ..19	2 2 .	17·75	418 3	12 11 10	27,841 0 6	66 16 8
Nov. .. 2	1,1.9	22 2.2	335 10	14 4 1	21,649 13 5	64 10 6
,, ..16	1,705	23 432	407 13	15 11 6	27,035 14 0	66 6 5
Dec. .. 7	1,.9.	25 775	439 3	16 14 5	29,603 19 6	67 8 3
,, ..21	1,759	24 125	369 5	13 4 6	23,788 7 6	64 8 6
Totals & avge. for the quar.	10,463	21·930	2,284 1	14 3 3	148,179 13 0	64 17 6
IRISH and WELSH ORES.						
Sold Oct. .. 5	294	8·333	24 10	4 15 6	1,488 14 6	60 15 3
,, ..19	799	9·337	69 0	5 18 7	4,382 2 6	63 10 2
Nov. .. 2	6.9	9·305	59 14	6 7 2	3,936 16 6	64 17 1
,, ..16	367	9·579	32 14	6 4 9	2,177 8 6	66 11 9
Dec. .. 7	749	9·409	71 3	6 6 6	4,735 19 6	66 11 3
,, ..21	476	9 999	47 11	6 5 1	2,977 0 6	62 12 2
Totals & avge.	2,225	9·472	305 12	6 2 1	19 698 2 0	64 9 2
TOTAL OF ALL SORTS.						
Sold Oct. .. 5	1,929	16·711	320 17	10 5 9	19,749 9 6	61 11 1
,, ..19	2,9.0	17·124	505 3	10 18 5	32,223 3 0	63 15 9
Nov. .. 2	2,129	18·609	396 4	12 0 4	25,586 9 0	64 11 7
,, ..16	2,.05	21·120	440 7	14 0 3	29,213 6 6	66 6 10
Dec. .. 7	2,3.0	21·901	510 6	14 14 9	34,339 19 0	67 5 10
,, ..21	2,275	18·325	416 16	11 15 4	26,765 8 0	64 4 4
Totals & avge.	13,669	18·917	2,589 13	12 5 2	167,877 15 0	64 16 6
Ditto, quarter ending Sept. 30, 1848 ..	12,628	—	—	10 12 10	134,390 2 0	

COMPARATIVE RETURNS

For the Years ending 30th June, in the Years 1846, 1847, and 1848.

	Quantity.	Average Produce per cent.	Computed quantity of fine copper	Average Price.	Amount of Sales.	Value of Ore to produce 1 ton of copper.
	21 cwt.		Tons. cwt.	£ s. d.	£ s. d.	£ s. d.
1846	64,987	15·062	9,788 5	11 10 6	748,914 15 0	76 10 3
1847	53,284	16·622	8,856 14	12 13 9	676 069 9 6	76 6 7
1848	50 731	17·040	8,644 10	12 8 2	629,660 8 0	72 16 8

SALES of FOREIGN ORES at SWANSEA,

For the Quarter ending Dec. 31, 1848.

CUBA.

Date of Sale.	Quantity.	Average Produce per cent.	Computed quantity of fine copper	Average Price.	Amount of Sales.	Value of Ore to produce 1 ton of copper.
				£ s. d.	£ s. d.	£ s. d.
COBRE ORES.	21 cwt.		Tons.cwt.			
October .. 5	963	15·883	152 19	9 13 6	9,319 1 6	——
,, .. 19	1,013	16·497	167 6	10 3 3	10,295 4 0	——
November 2	989	15·865	156 18	10 0 11	9,936 18 0	——
,, 16	442	15·764	69 13	10 1 1	4,443 1 0	——
December 7	517	19·905	102 18	12 14 8	6,584 2 0	——
,, 28	835	17·381	145 3	10 19 1	9,148 4 6	——
Totals & avgs.	4,759	16·702	794 17	10 9 0	49,726 7 0	62 11 3
CUBA ORES.						
October .. 5	523	14·623	76 9	8 17 7	4,644 15 6	——
,, .. 19	452	15·457	68 14	9 16 0	4,429 1 0	——
November 16	466	14·674	67 10	9 9 0	4,346 11 0	——
December 28	311	12·942	40 5	8 9 5	2,634 3 6	——
Totals & avgs.	1,746	14·192	247 18	9 3 11	16,054 11 0	64 15 3
SANTIAGO.						
October .. 19	353	13·131	45 1	8	2,951 1 0	65 10 1
Totals & avgs.	6,858	15·862	1,087 16	10 0 5	68,732 3 0	63 3 8

CHILI.

Date of Sale.	Quantity.	Average Produce per cent.	Computed quantity of fine copper	Average Price.	Amount of Sales.	Value of Ore to produce 1 ton of copper.
				£ s. d.	£ s. d.	£ s. d.
CHILI ORES.	21 cwt.		Tons.cwt.			
October .. 5	107	54·871	58 14	35 0 5	3,747 9 0	——
,, .. 19	210	52·140	109 10	31 6 8	6,579 12 0	——
November 2	339	39·296	133 5	25 4 11	8,558 12 0	——
,, .. 16	376	36·551	137 9	24 0 9	9,038 14 0	——
December 7	347	37·331	129 13	24 7 9	8,463 5 6	——
Totals & avgs.	1,379	41·229	568 11	26 7 9	36,387 12 6	64 0 0
COPIAPO.						
November 16	255	27·749	70 15	19 3 4	4,887 6 6	——
December 7	231	27·429	63 7	19 3 9	4,432 9 6	——
,, 28	279	27·303	76 3	17 5 4	4,817 0 6	——
Totals & avgs.	765	27·484	210 5	18 9 7	14,136 16 6	67 4 9
Totals&avgs. from Chili	2,144	36·325	778 16	23 11 4	50,524 9 0	64 17 6

AUSTRALIA.

Date of Sale.	Quantity.	Average Produce per cent.	Computed quantity of fine copper	Average Price.	Amount of Sales.	Value of Ore to produce 1 ton of copper.
BURRA B.	21 cwt.		Tons. cwt.	£ s. d.	£ s. d.	£ s. d.
October .. 19	183	27·869	50 12	19 11 11	2,156 2 6	——
November 2	87	29·875	17 1	21 2 6	1,284 2 6	——
,, 16	143	30·300	43 6	27 3 9	3,630 5 6	——
December 7	262	30·677	111 1	21 18 2	7,931 6 6	——
,, 28	374	28·797	107 14	19 4 5	7,189 19 0	——
Totals & avgs.	1,119	29·464	329 14	20 10 0	22,940 16 0	69 11 8
KAPUNDA.						
November 2	125	23·640	26 6	15 12 6	1,980 0 0	——
December 7	62	24·875	15 8	16 14 0	1,035 8 0	——
Totals & avgs.	187	23·269	43 14	15 19 4	2,985 8 0	69 6 4
PRINCESS R.						
November 16	60	31·625	19 0	21 10 0	1,290 0 0	——
December 7	62	27·113	16 16	18 12 0	1,157 8 0	——
Totals & avgs.	122	29·344	35 16	20 1 3	2,447 8 0	69 7 3
AUSTRALIA.						
October .. 5	23	25·000	5 5	16 13 0	349 9 0	65 12 0
Totals & avgs.	1,461	28·710	417 9	19 15 11	28,923 1 0	69 5 8

SUMMARY.

With Comparative View of British and Foreign Ores.

	Quantity.	Average Produce per cent.	Computed quantity of fine copper	Average Price.	Amount of Sales.	Value of Ore to produce 1 ton of copper.
	21 cwt.		Tons. cwt.	£ s. d.	£ s. d.	£ s. d.
CUBA	6,858	15·862	1,087 16	10 0 5	56,732 3 0	52 3 3
CHILI	2,144	26·325	778 16	28 11 4	50,524 9 0	64 17 6
AUSTRALIA.	1,461	28·710	417 9	19 15 11	28,923 1 0	69 5 8
Totals of Foreign Ores..	10,463	21·830	2,284 1	14 3 3	148,179 13 0	64 17 6
Cornish ticketings for the quarter ...	35,972*	8·864	3,060 8	4 18 4	176,839 0 6	57 8 3
Excess of English Ores above foreign	25,509	——	796 7	——	28,663 7 6	——
Excess of foreign above English	—	13·266	——	9 4 11	——	7 9 3

* The quantities, and other details in this line, it will be observed, apply exclusively to the ores sold in Cornwall. The Irish and Welsh ores sold at Swansea in the quarter, amounting to 3,226 tons of ore, computed to yield 305 tons 12 cwt. of copper, which sold for £19,698. 2*s.* 6*d.* These amounts must be added to those applicable to the Cornish ticketings, to give the entire quantities and value of *British* ores sold in the quarter.

Quantities of COPPER ORE imported from CHILI, which paid Duty, in the Five Years 1843 to 1847, inclusive.

Year.	Copper Ore which paid Duty.	Metallic Copper charged with Duty.	Average Per-cent. of Metal in the Ore.	Amount of Duty received.	Rate of Duty computed at per Ton of Ore.	Rate of Duty computed at per Ton of Metal.	Mean Price of Cake Copper.	Rate per cent. of Duty on value of Copper.
	Tons.	Tons.		£	£ s. d.	£ s. d.	£ s. d.	
1843	19,364	5,590	28·86	34,306	1 15 5	6 2 8	83 5 0	7·367
1844	19,302	5,646	29·25	34,749	1 16 0	6 3 1	85 5 0	7·219
1845	10,824	3,624	33·48	22,562	2 1 8	6 4 6	88 10 0	7·034
1846	12,982	4,221	32·51	25,983	2 0 0	6 3 1	90 15 0	6·781
1847	8,665	3,079	35·53	19,260	2 4 6	6 5 1	96 10 0	6·480
Totals.....	71,137	22,160	31·15	136,862	1 18 6	6 3 6	88 17 0	6·950

Quantities of COPPER ORE imported from CUBA, which paid Duty, in the Five Years 1843 to 1847, inclusive.

Year.	Copper Ore which paid Duty.	Metallic Copper charged with Duty.	Average Per-cent. of Metal in the Ore.	Amount of Duty received.	Rate of Duty computed at per Ton of Ore.	Rate of Duty computed at per Ton of Metal.	Mean Price of Cake Copper.	Rate per cent. of Duty on value of Copper.
	Tons.	Tons.		£	£ s. d.	£ s. d.	£ s. d.	
1843	31,355	5,279	16·84	26,226	0 16 9	4 19 4	83 5 0	5·966
1844	34,970	6,605	18·88	35.054	1 0 1	5 6 2	85 5 0	6·227
1845	41,171	6,602	16·04	31,747	0 15 5	4 16 2	88 10 0	5·433
1846	31,937	4,935	15·45	22,963	0 14 5	4 13 0	90 15 0	5·124
1847	23,897	3,843	16·08	17,816	0 14 10	4 12 9	96 10 0	4·806
Totals.....	163,330	27,264	16·69	133,806	0 16 5	4 18 2	88 17 0	5·243

Quantities of COPPER ORE imported from AUSTRALIA and other BRITISH POSSESSIONS, in the Five Years 1843 to 1847, inclusive.

Year.	Copper Ore which paid Duty.	Metallic Copper charged with Duty.	Average Per-cent. of Metal in the Ore.	Amount of Duty received.	Rate of Duty computed at per Ton of Ore.	Rate of Duty computed at per Ton of Metal.	Mean Price of Cake Copper.	Rate per cent. of Duty on value of Copper.
	Tons.	Tons.		£	£ s. d.	£ s. d.	£ s. d.	
1843	13	Not assayed	..	14	..	..	83 5 0	Not assayed
1844	157	15	9·55	15	0 1 11	1 1 0	85 5 0	1·232
1845	969	187	19·30	198	0 4 1	1 1 0	88 10 0	1·186
1846	3,753	819	21·82	860	0 4 7	1 1 0	90 15 0	1·157
1847	6,722	1,626	24·19	1,725	0 5 2	1 1 0	96 10 0	1·088
Totals.....	11,601	2,647	22·82	2,798	0 4 10	1 1 0	88 17 0	1·182

Quantities of FOREIGN COPPER ORE which paid Duty in the United Kingdom, in the Five Years 1843 to 1847, inclusive.

Year.	Copper Ore which paid Duty.	Metallic Copper charged with Duty.	Average Per-cent. of Metal in the Ore.	Amount of Duty received.	Rate of Duty computed at per Ton of Ore.	Rate of Duty computed at per Ton of Metal.	Mean Price of Cake Copper.	Rate per cent. of Duty on value of Copper.
	Tons.	Tons.		£	£ s. d.	£ s. d.	£ s. d.	
1843	54,370	11,654	21·43	64,445	1 3 8¼	5 10 7	83 5 0	6·641
1844	58,591	13,190	22·51	75,201	1 5 8	5 14 0	85 5 0	6·685
1845	56,119	11,172	19·90	58,646	1 0 10½	5 5 0	88 10 0	5·932
1846	50,944	10,661	20·92	54,056	1 0 2½	5 1 5	90 15 0	5·587
1847	40,491	9,033	22·31	40,964	1 0 3	4 10 8	96 10 0	4·697
Totals.....	260,515	55,710	21·38	293,312	1 2 6	5 5 4	88 17 0	5·927

NOTE.—The amount for 1848 has been presented to Parliament monthly; a statement, which with the Annual Returns, is introduced in another place.

TABLE of the average Prices of COPPER ORES imported from CHILI, CUBA, and AUSTRALIA and other BRITISH POSSESSIONS, in the Four Years ending 30th June, 1847, showing the Average Rate per Cent. which the Duty paid upon the Ores.

Price per Ton in	Average Price of Ore from Chili.	Average Price of Ore from Cuba.	Average Price of Ore from Australia, &c.	Average Prices of Ores from the three places.
	£ s. d.	£ s. d.	£ s. d.	£ s. d.
1844	21 5 7	15 2 5	..	16 16 7
1845	22 12 9	13 1 0	9 7 0	15 1 10
1846	25 17 6	12 9 7	16 16 2	14 3 4
1847	24 12 4	12 5 4	18 2 0	15 15 0
Annual Average	23 6 3	13 5 5	17 17 3	15 9 1
Average rate of Duty per ton	1 18 6	0 16 5	0 4 10	
Rate per cent. of Duty....	8·258	6·185	1·353	

COPPER-SMELTING ESTABLISHMENTS.

	1. Mines Royal Company.	2. Vivian and Sons.	3. Freeman and Company.	4. Pascoe Grenfell and Sons.
Cashier	J. W. Bevan	Oct. Williams	H. M. Grylls	Alfred Jenkin
Assayer	J. W. Bevan	Steph. Williams	S. Michell	S. Mitchell
Sample taker	Alex. Vivian	Henry Williams	R. Hichens	— Angove
Clerk	Charles Bone	— Hernaman	W. M. Grylls	— Jenkins

	5. Williams's Crown Copper Co.	6. Sims, Willyams, and Company.	7. Williams, Foster, and Company.	8. John Schneider and Company.
Cashier	W. Williams	H. Willyams	M. Williams	John Penrose
Assayer	W. Andrew	J. Christoe	J. Andrew	John Penrose
Sample taker	T. Bawden	W. H. Tregoning	T. Bawden	E. Angove
Clerk	A. Skewes	R. Christoe	A. Skewes	R. Sampson.

PRODUCE of MINES in CORNWALL and DEVON for 1848.

No. 1. MINES.	QUARTER ENDING March 25.				QUARTER ENDING June 24.				QUARTER ENDING September 29.				QUARTER ENDING December 31.				TOTALS.			
	Tons.	£	s.	d.	Tons.	£	s.	d.	Tons.	£	s.	d.	Tons.	£	s.	d.	Tons.	£	s.	d.
Devon Great Consols	3,826	24,353	18	0	4,368	24,520	5	6	3,808	18,743	7	0	4,432	25,800	15	6	16,374	94,418	6	0
Carn Brea	2,534	17,173	12	6	2,761	16,153	9	0	2,573	13,544	8	0	2,564	15,759	17	6	10,432	62,631	7	0
Par Consols	2,114	16,129	16	6	2,467	14,877	4	6	2,313	13,178	17	6	1,990	12,263	4	0	8,884	56,549	2	6
Great Consolidated	2,059	11,605	16	6	2,620	12,982	3	0	2,966	13,796	13	6	1,495	7,510	9	0	9,140	45,849	2	6
Great United	3,204	14,065	15	6	2,608	9,882	15	6	3,859	12,943	16	0	3,151	11,400	14	0	12,822	48,293	1	0
Fowey Consols	1,557	8,355	5	6	1,653	8,794	15	6	1,115	5,177	7	6	1,455	7,945	17	0	5,780	30,273	5	6
Wheal Seton	1,158	6,341	14	0	1,493	7,282	11	0	1,314	5,679	10	0	1,518	7,193	1	6	5,483	26,496	16	6
North Pool	834	3,704	6	0	1,745	6,931	6	6	1,318	4,237	6	6	1,679	5,388	19	0	5,576	21,261	18	0
Wheals Prosper and Friendship	—	—			1,288	6,433	6	6	754	4,983	15	6	671	4,886	0	0	2,713	16,203	2	0
West Caradon	864	5,607	2	6	993	6,207	14	6	861	5,789	18	6	845	6,225	10	0	3,563	23,830	5	6
South Caradon	—	—			1,021	6,164	11	6	1,048	6,543	9	6	679	4,179	14	0	2,748	16,887	15	0
North Roskear	1,588	8,139	19	6	957	4,765	0	6	1,944	8,607	8	0	1,000	4,470	0	0	5,489	26,072	8	0
Tincroft	1,117	3,884	2	0	1,306	4,098	2	6	645	2,101	16	0	894	2,979	2	0	3,962	13,063	2	6
East Wheal Crofty	502	2,711	15	0	996	3,746	12	0	448	1,886	6	6	1,154	5,108	12	0	3,100	12,453	5	6
Stray Park..	561	2,693	8	0	999	3,724	19	0	513	1,872	2	0	1,002	4,124	1	6	3,075	12,414	10	6
Tresavean	642	2,330	2	0	1,136	3,610	15	6	1,111	3,952	1	0	834	3,017	19	0	3,723	12,910	17	6
South Wheal Francis	790	6,642	11	6	558	3,137	17	0	672	4,768	2	6	442	4,489	5	0	2,462	19,037	16	0
South Wheal Basset	332	2,302	1	0	660	3,112	19	0	478	2,760	9	6	385	2,228	19	0	1,795	10,404	8	6
Treviskey and Barrier	381	2,149	16	0	685	2,970	8	0	759	3,350	13	6	361	1,983	15	0	2,186	10,454	12	6
Treleigh	413	2,207	7	6	396	2,251	3	6	409	2,251	4	6	203	1,030	12	6	1,421	7,740	8	0
Perran St. George and Bolenna	309	1,055	5	0	653	2,155	19	6	742	2,330	4	0	99	497	2	0	1,803	6,038	10	6
Bedford United	348	2,352	2	0	349	1,958	2	6	—	—			—	—			697	4,310	4	6
Dolcoath	261	1,266	12	0	467	1,879	5	6	199	959	1	6	327	1,482	17	0	1,254	5,587	16	0
Condurrow..	288	1,092	18	0	478	1,521	3	0	242	736	8	6	582	2,386	7	6	1,590	5,737	16	0
Levant	369	2,462	12	0	234	1,406	1	0	550	2,752	6	0	623	3,236	4	0	1,776	9,847	3	0
Grambler and St. Aubyn ..	175	744	16	0	330	1,218	9	0	274	1,061	5	6	93	413	13	6	872	3,438	4	0
Wheal Ellen	107	655	12	6	212	1,174	11	0	226	1,264	2	6	96	554	8	0	651	3,648	14	0
Great Work	—	—			106	1,138	6	0	—	—			37	299	14	0	143	1,438	0	0
Wheal Bucketts	305	1,816	5	0	323	1,092	10	0	232	740	0	0	209	755	1	0	1,069	3,903	16	0

No. 2. MINES—*continued.*	QUARTER ENDING March 25.				June 24.				September 29.				December 31.				TOTALS.			
	Tons.	£	s.	d.	Tons.	£	s.	d.	Tons.	£	s.	d.	Tons.	£	s.	d.	Tons.	£	s.	d.
West Wheal Jewel	164	478	4	0	327	1,019	0	6	73	243	7	0	125	388	7	6	689	2,127	19	0
Trethellan	166	442	2	6	368	1,015	10	0	308	749	6	6	173	542	13	6	1,015	2,749	12	6
Wheal Tremayne	159	727	13	6	200	927	5	0	184	624	3	0	321	861	5	0	864	3,140	6	6
Marke Valley	261	818	2	0	420	921	4	0	182	522	7	0	356	1,034	5	6	1,219	2,306	18	6
Alfred Consols	469	1,296	3	6	295	892	0	6	296	595	1	0	88	242	0	0	1,148	3,125	5	0
East Pool	161	561	9	6	289	888	11	0	209	637	8	0	429	1,452	17	6	1,088	3,550	6	0
Poldice	480	2,221	7	0	218	887	15	0	293	1,173	19	0	136	576	10	0	1,127	4,859	11	0
North Wheal Basset	172	942	17	6	172	857	2	0	—	—			—	—			344	1,799	19	6
Holmbush	98	546	7	0	188	856	14	0	54	276	15	0	58	246	0	0	398	1,925	16	0
Wheal Sisters	126	765	12	0	199	838	9	0	40	125	6	0	—	—			365	1,729	7	0
Andrew and Nangiles	78	356	14	0	187	818	12	0	157	660	11	6	37	170	6	0	459	2,006	3	6
Wheal Agar	189	861	9	6	224	800	5	6	232	885	13	0	372	1,385	3	0	1,017	3,852	2	0
South Roskear	365	1,746	11	0	169	799	18	6	436	1,854	19	6	185	911	7	0	1,095	5,312	16	0
Creegbraws	445	1,973	12	6	193	797	16	0	452	1,785	6	6	426	1,437	5	0	1,516	5,994	0	0
Wheal Mary Consols	—		—		137	692	11	0	363	1,970	7	6	264	1,332	2	6	764	3,995	1	0
South Wheal Fortune	86	621	12	0	118	624	13	6	58	275	9	6	80	324	16	6	339	2,046	11	6
Wellington Mines	39	131	19	0	76	605	2	6	40	278	4	0	144	1,336	2	6	299	2,351	8	0
West Wheal Treasury	265	1,569	0	0	131	596	7	6	385	1,748	14	0	163	694	0	0	944	4,648	1	6
Tywarnhale	141	503	14	6	228	554	6	6	—	—			939	3,330	14	6	1,308	4,388	15	6
Wheal Comfort	656	1,874	3	0	263	530	1	6	797	1,881	10	6	636	1,418	8	0	2,352	5,704	3	0
Wheal Clifford	56	197	8	0	157	501	2	0	92	251	7	6	—				305	949	17	6
Phœnix	—		—		42	445	4	0	78	621	0	0	77	677	4	6	194	1,743	8	6
Wheal Rodney	—		—		192	443	5	0	—		—		—		—		192	443	5	0
Wheal Jane	77	238	6	0	166	385	9	6	35	106	15	0	8	18	8	0	286	748	18	6
Wheal Gorland	34	179	7	0	71	329	14	0	—		—		—		—		105	509	1	0
Wheal Mary	50	290	5	0	85	250	2	6	—		—		142	722	15	0	135	1,333	3	6
Wheal Williams	31	155	0	0	47	247	18	6	72	280	14	6	20	70	0	0	170	753	13	0
Wheal Jewel	314	1,721	11	6	86	231	4	0	78	250	15	0	17	75	4	6	495	2,278	15	0
Wheal Henry	58	358	6	6	54	217	7	0	89	315	18	6	110	578	1	0	311	1,469	13	0
Botallack	—		—		35	204	15	0	40	166	0	0	—		—		75	370	15	0

No. 3. MINES—*continued.*	QUARTER ENDING March 25.				QUARTER ENDING June 24.				QUARTER ENDING September 29.				QUARTER ENDING December 31.				TOTALS.			
	Tons.	£	s.	d.	Tons.	£	s.	d.	Tons.	£	s.	d.	Tons.	£	s.	d.	Tons.	£	s.	d.
Gwinear Consols	110	201	5	0	109	202	19	6	37	263	0	0	6	41	17	0	264	710	1	6
Wheal Tryphena	19	365	5	6	16	192	16	0	10	93	0	0	—	—	—		45	651	1	6
Wheal Harriet	135	323	14	6	60	174	0	0	66	156	18	0	20	70	0	0	181	654	12	6
Wheal Prudence	—		—		57	170	7	6	57	126	13	6	—		—		114	297	1	0
West Fowey Consols	—		—		39	156	19	6	—		—		70	378	0	0	109	534	19	6
Wheal Gurlin	85	442	3	6	33	156	15	0	—		—		—		—		118	598	18	6
Charlestown	30	272	3	6	13	148	17	0	75	594	7	6	90	513	0	0	208	1,528	8	0
South Tolgus	76	396	3	0	35	126	17	6	133	518	13	0	173	759	7	6	417	1,777	1	0
Wheal Vyvyan	15	78	7	6	24	120	1	6	26	136	10	0	24	126	18	0	89	461	17	0
Wheal Busy	34	98	12	0	58	119	4	6	59	144	15	0	42	103	19	0	193	466	10	0
Wheal Brewer	47	92	15	6	49	113	12	6	28	49	14	0	47	78	4	0	171	334	6	0
Gonamena	35	310	12	6	14	107	16	0	—		—		26	148	4	0	75	566	12	6
Lanivet	63	249	11	6	43	101	1	0	33	59	4	0	—		—		49	409	16	6
West Trethellan	97	290	19	6	36	86	8	0	78	207	12	6	55	138	12	0	266	723	12	0
Wheal Maiden	75	306	0	0	31	85	5	0	68	220	6	6	20	82	0	0	194	702	11	6
East Downs	53	310	15	6	19	78	7	6	19	70	3	0	24	99	12	0	115	557	18	0
Ting Tang	—		—		22	53	9	0	43	110	17	0	34	57	12	0	99	227	18	0
Cook's Kitchen	27	133	12	0	16	46	0	0	—		—		5	37	7	6	48	216	19	6
North Downs	25	82	6	0	10	36	15	0	—		—		18	69	7	0	53	188	8	0
Bedford United	—		—		—		—		308	1,724	16	6	309	1,436	6	6	617	3,161	3	0
West Wheal Seton	—		—		—		—		—		—		236	1,095	9	0	236	1,095	9	0
Wheal Pink	—		—		—		—		57	212	6	6	126	598	19	0	183	811	5	6
Tincroft	—		—		—		—		290	904	16	6	—		—		290	904	16	6
Wheal Basset	—		—		—		—		—		—		316	1,584	16	0	316	1,584	16	0
Sundry Mines, No. 4																	1,117	3,513	8	6
Total for 12 months																	20,715	£714,064	17	6

NOTE.—There will be found a slight variation on comparing the above with other returns, but of no considerable moment, such being unavoidable.

The following MINES have also made RETURNS during the past Year. No. 4.

	Tons.	Amount. £	s.	d.
East Seton	113	499	15	6
Great Michell Consols	157	404	7	6
Wheal Penhale	33	227	14	0
West Wheal Providence	38	298	7	6
Trenance	15	200	9	0
Budnick	35	194	7	6
Wheal Prosper	84	182	0	0
East Relistian	31	138	14	6
Wheal Virgin	34	138	10	0
East Wheal Agar	22	123	15	0
Caradon	29	106	12	0
Unity Wood	31	112	16	0
Polgooth	31	177	17	6
Wheal Union	16	101	16	0
Wheal Venture	16	111	16	0
Wheal Rose	12	79	4	6
Tokenbury	26	70	17	0
Copper Bottom	8	68	0	0
West Bassett	10	59	0	0
Rose in Vale	15	45	0	0
Silver Hill	25	38	5	0
Trenow Consols	10	20	0	0
Pentsruthal	5	16	10	0
East Crinnis	3	13	14	6
	797	2,499	7	0

	Tons.	Amount. £	s.	d.
Brought forward	797	2,499	7	0
Freslow	12	9	0	0
Lewis	16	98	16	0
South Towan	20	73	2	6
Tamar	13	68	18	0
Carn Perran	16	65	4	0
Wheal Ruby	24	72	14	0
United Hills	20	52	0	0
Wheal Vor	8	42	12	0
Providence Mines	44	70	4	0
Tretoil	17	34	17	0
St. Austell Consols	12	33	0	0
Pembroke	1	5	6	0
Trenoweth	8	22	4	0
Wheal Speed	6	20	17	0
Owen Vean	4	18	2	0
Lanarth	5	15	15	0
Wheal Hope	3	6	0	0
Wheal Ayr	22	86	7	0
Ashburton United	12	71	14	0
East Crowndale	22	66	4	0
Wheal Godolphin	21	40	8	6
Wheal Pleasant	11	26	8	0
Wheal Edward	3	14	18	6
Total	1,117	3,513	8	6

PRODUCE of CORNISH MINES.—Table showing the Quantity of Copper Ore raised in Cornwall, Fine Copper produced, Amount in Money, Standard, Produce and Price, for each week in the year 1848, with Companies by whom purchased.

Date.	Standard.	Produce.	Price.	Quantity of ore.	Quantity of fine copper.	Amount.	Mines Royal.		Vivian and Sons.		Freeman and Co.		Grenfell and Sons.		Sims, Willyams, and Co.		Williams, Foster, and Co.	
			£ s. d.	21 cwt.		£ s. d.	Tons.	£	Tons.	£	Tons.	£	Tons.	£	Tons.	£	Tons.	£
1847. Dec. 30	96·19	8	5 3 0	2,977	237·13	15,334 9 6	900	1,210	486	2,976	603	2,619	252	1,126	496	2,479	421	3,088
1848. Jan. 6	99·1	8½	5 8 0	3,444	282·14	18,831 14 0	156	760	729	3,423	606	3,049	317	1,572	455	2,284	769	5,035
,, 13	94·6	9½	5 17 0	2,279	208·7	13,378 16 0	138	641	553	3,687	303	1,555	383	1,650	254	1,317	619	4,392
,, 20	87·14	10	6 0 0	2,693	268·3	16,118 6 6	59	318	640	4,061	424	2,048	242	1,437	645	3,643	663	4,600
,, 27	101·5	7½	4 14 6	4,210	311·12	19,976 4 6	80	318	1,089	4,674	691	3,222	714	2,902	573	2,622	998	5,749
Feb. 3	102·19	7½	4 19 0	4,294	319·17	21,132 6 6	187	1,064	1,130	4,617	505	2,789	556	2,529	641	3,281	1,275	6,847
,, 10	97·	7½	5 17 0	2,148	190·14	12,596 19 0	155	865	427	2,524	392	2,043	439	1,489	235	1,521	400	3,551
,, 17	91·7	10½	6 14 0	2,506	259·3	16,787 8 0	88	461	575	3,700	456	2,906	440	1,638	385	2,587	714	6,047
,, 24	106·3	7½	4 19 0	2,637	192·5	13,163 7 6	78	450	391	2,305	462	2,511	995	4,016	382	1,604	329	2,275
March 2	102·16	7½	5 7 6	3,237	256·16	17,803 3 0	233	1,078	661	3,638	484	3,169	188	821	672	3,098	990	5,701
,, 9	97·13	8½	5 16 0	2,315	203·1	13,466 17 6	279	1,114	581	3,933	413	1,943	499	2,581	130	445	394	3,271
,, 23	93·1	9½	5 17 0	2,922	271·7	17,223 3 6	323	1,295	785	4,717	199	1,088	362	1,905	830	3,258	676	4,667
Avgs. & Totals	97·13	8½	5 11 0	35,662	3,062·2	195,212 18 6	2,076	9,579	7,847	43,560	5,542	28,959	5,387	28,852	5,498	29,127	8,965	55,847
March 30	100·11	7½	4 13 6	4 852	357·16	22,639 3 6	412	1,296	1,089	5,669	594	2,676	740	2,809	716	3,045	1,172	6,396
April 6	99·9	7½	4 5 0	5,080	360·3	21,498 12 0	196	566	1,318	5,716	461	1,830	790	2,746	642	2,417	1,234	7,248
,, 13	89·3	9½	5 11 6	2,493	232·19	13,912 12 6	176	542	580	3,811	136	931	398	1,489	301	1,417	691	5,214
,, 20	94·10	9½	5 9 6	3,012	292·1	16,402 10 6	106	362	691	4,447	480	2,234	524	2,019	287	1,359	927	5,847
,, 27	94·16	7½	4 3 0	2,702	196·19	11,241 19 0	155	645	492	2,845	348	1,377	395	1,030	491	1,816	688	3,604
May 4	92·3	8½	4 17 6	3,271	269·7	15,813 14 6	134	670	712	3,413	520	2,749	555	2,482	669	2,978	681	3,570
,, 11	88·12	8½	4 15 0	2,594	221·14	12,510 14 6	145	564	691	3.509	292	1,341	421	1,219	198	838	827	3,318
,, 18	81·17	10½	5 10 0	2,787	231·3	15,355 11 0	143	567	837	4,581	413	1.776	229	1,006	312	1,669	885	5,734
,, 25	90·6	7½	3 19 0	4.562	339·5	18,098 9 6	141	579	1,259	4,480	307	2,920	516	2,185	602	2,405	1,232	5,480
June 1	92·4	7½	3 17 0	3,966	284·4	15,304 14 6	150	576	999	3,705	409	1,743	614	2,421	516	2,088	1,196	4,472
,, 8	84·4	9½	5 2 0	1.773	165·5	9.041 9 6	267	1,395	451	2,232	308	1,388	—	—	288	908	518	2,905
,, 22	82·13	9½	4 14 6	2,926	290·5	15,951 3 6	25	101	559	3,178	182	916	169	459	800	3,648	1,190	7,649
Avgs. & Totals	89·	8½	4 7 0	40,018	3,291·1	187,770 14 6	2,053	8,018	9,818	46,692	4,881	21,888	5,291	19,818	5,766	24.289	11,408	68,332

Date.	Standard.	Produce.	Price.	Quantity of ore.	Quantity of fine copper.	Amount.	Mines Royal.		Vivian and Sons.		Freeman and Co.		Grenfell and Sons.		Sims, Willyams, and Co.		Williams, Foster, and Co.	
			£ s. d.	21 cwt.		£ s. d.	Tons.	£	Tons.	£	Tons.	£	Tons.	£	Tons.	£	Tons.	£
1848. June 29	93·19	7½	4 1 6	2,739	199·6	11,199 6 0	324	1,465	391	1,576	357	1,354	765	2,431	614	2,313	348	2,058
July 6	88·8	8½	4 17 0	3,396	288·18	16,189 17 0	411	2,033	792	3,072	798	3,049	749	3 471	457	2,003	253	1,566
,, 13	80·2	9½	4 12 0	2,372	219·7	11,039 11 0	172	771	765	2,871	131	509	266	605	230	1,038	893	5,071
,, 20	78·8	9½	4 18 0	2,710	264·14	13,309 12 0	148	549	676	3,537	316	1,600	196	768	446	2,304	928	4,550
,, 27	87·5	7½	3 18 0	4,539	345·19	17,717 7 0	349	1,362	946	3,664	620	2,451	1,015	3,821	945	3,397	664	3,018
Aug. 3	88·11	7½	3 17 6	4,184	313·11	16.257 2 0	251	1,025	1,084	4,354	272	1,301	442	1,373	581	2,129	1,554	6,072
,, 10	90·10	9½	5 0 0	1,355	130·7	6,767 7 0	225	1,471	464	2,088	124	479	47	133	170	606	319	1,962
,, 17	77·17	10½	5 7 0	2,222	230·16	11,866 7 0	102	601	597	3,282	346	1,703	208	976	218	1,108	569	3,310
,, 24	90·13	7½	3 14 6	2,260	163·5	8,420 18 6	293	1,126	435	1,934	288	1,280	288	707	495	1,726	175	472
,, 31	91·2	7½	4 4 0	4,228	324·5	17,916 18 0	340	1,535	750	2,907	540	1,564	741	3,322	590	3,045	592	2,449
Sept. 7	85·7	9½	5 2 6	1.923	177·5	9,847 0 6	179	1,122	452	2,344	361	2,250	292	872	132	347	347	2,078
,, 21	81·5	10½	5 1 0	2,592	273·	15,065 15 6	134	636	684	3,778	264	1,712	280	1,313	472	2,617	665	4,642
,, 28	91·19	7½	4 9 0	4,506	352·	20,011 15 0	408	1,981	860	4,025	524	1,994	848	3,704	865	2,711	732	4,468
Avgs. & Totals	86·	8½	4 12 6	39,026	3282·13	175,509 16 6	3,336	15,681	8,746	39,438	4,941	22, 201	6,016	23, 503	6,215	25, 350	8,038	41,723
Oct. 5	92·17	8½	4 15 6	4.027	326·19	19 297 2 6	318	1,810	809	4,033	523	2.915	665	2,988	565	2,392	1,004	4,546
,, 12	88·4	9½	5 13 0	2,226	211·12	12,548 15 0	435	1,988	308	3,155	245	973	320	1,742	362	1,899	394	2,542
,, 19	84·13	10½	5 16 0	2.505	252·18	14.521 11 0	66	365	598	3,419	399	2,123	345	1,754	472	2,962	544	3,450
,, 26	95·1	7½	4 1 0	2,165	155·2	8,794 2 6	212	870	346	1,896	109	527	426	1,701	513	2,133	296	1,582
Nov. 2	93·17	7½	4 13 0	3,626	286·2	16,884 6 0	175	951	615	2,658	466	1,676	940	4,128	456	2,120	868	4,814
,, 9	96·15	9½	5 15 6	1,928	189·9	11,139 14 0	—	—	464	2,428	298	2,393	281	1,846	304	1,566	414	2,268
Nov. 23	93·10	10½	6 4 6	2,744	294·17	17.074 16 6	228	1,156	694	4,749	244	1,434	346	1,923	439	2,732	654	4,436
,, 30	93·2	7½	4 9 6	4.571	356·4	20,601 14 6	254	1,209	893	3,974	598	2,182	411	1,461	735	3,146	1,332	7,091
Dec. 7	94·3	7½	4 6 0	4.240	319·4	18.396 12 0	191	877	976	3,721	446	1,764	656	3,082	594	2,570	909	4,749
,, 14	97·9	8½	4 16 6	2.692	233·3	12,996 17 0	178	810	732	3.524	697	2,542	430	1,622	208	886	454	3,244
,, 21	81·12	10½	5 10 6	2,722	275·15	15,026 16 6	124	497	585	8,638	368	1,682	501	2,210	463	2,004	642	4,026
,, 28	92·1	7½	3 15 6	2.526	179·3	9,550 13 0	—	—	496	1,947	412	1,886	391	1,461	425	1,456	683	2,393
Avgs. & Totals				35.972	3,080·8	176,833 0 6	2,180	10,538	7,556	38,838	4,795	21.902	5,712	25,904	5,346	26,471	8,279	45,143

NOTE.—The aliquot parts of a £ are not given in the preceding Tables.
In addition to the purchases in the last quarter is to be added Schneider & Co. £7,908.

QUARTERLY SALES of COPPER ORES in CORNWALL for the Five Years ending 31st December, 1848.

		Tons.	£	s.	d.
Quarter ending March 31, 1844 ..	..	39,874	219,019	3	0
,, ,, June 30, ,, ..	..	37,306	188,721	8	0
,, ,, Sept. 20, ,, ..	..	38,073	195,626	17	6
,, ,, Dec. 31, ,, ..	..	37,716	198,066	16	0
Total ..	..	Tons 152,969	£801,434	4	6
Quarter ending March 31, 1845 ..	..	40,367	215,284	3	0
,, ,, June 30, ,, ..	..	40,844	226,373	3	0
,, ,, Sept. 30, ,, ..	..	42,420	250,257	1	6
,, ,, Dec. 31, ,, ..	..	38,926	228,019	18	6
Total ..	..	Tons 162,557	£919,934	6	0
Quarter ending March 31, 1846 ..	..	39,335	207,697	10	0
,, ,, June 30, ,, ..	..	32,232	200,810	11	6
,, ,, Sept. 30, ,, ..	..	37,784	196,486	16	0
,, ,, Dec. 31, ,, ..	..	35,079	191,197	9	0
Total ..	..	Tons 144,430	£796,192	6	6
Quarter ending March 31, 1847 ..	..	38,071	222,542	9	0
,, ,, June 30, ,, ..	..	34,875	204,662	4	6
,, ,, Sept. 30, ,, ..	..	40,174	229,969	2	6
,, ,, Dec. 31, ,, ..	..	40,000	216,262	14	0
Total ..	..	Tons 153,120	£873,436	10	0
Quarter ending March 31, 1848 ..	..	37,537	202,517	9	0
,, ,, June 30, ,, ..	..	37,905	176,330	17	0
,, ,, Sept. 30, ,, ..	..	36,287	164,409	10	6
,, ,, Dec. 31, ,, ..	..	35,972	176,833	0	6
Total ..	..	Tons 147,701	£720,090	17	0

QUARTERLY SALES of COPPER ORES in CORNWALL, for the Year 1848.

Quarter ending	Ore, in Tons of 21 cwt.	Fine Copper.	Amount of Money.	Aver. per cent.	Average stand.	Average price per Ton.
		Tons. ct. qr. lb.	£ s. d.			£ s. d.
March 31	37,537	3,121 15 0 0	202,517 9 0	8 1/16	97·18	5 8 0
June 30	37,905	3,133 6 3 22	176,330 17 0	8 1/4	89·11	4 13 0
September 30 ..	36,287	3,083 14 0 0	164,409 10 6	8 1/2	85·13	4 10 6
December 31 ..	35,972	3,080 11 1 27	176,833 0 6	9 1/16	89·10	4 18 6
Total ..	147,701	12,419 7 1 21	720,090 17 0	8 1/16	90·13	4 18 9

PURCHASES of COPPER ORES in CORNWALL for 1848.

Companies.	Tons.	Amount.
Mines Royal	9,459	£50,666 5 8
English Copper Company	19,880	106,977 16 5
Vivian & Sons	32,701	174,908 18 1
Freeman & Co.	18,006	98,640 3 4
P. Grenfell & Sons	18,512	103,276 19 5
Crown Copper Company	1,185	7,091 10 0
Sims, Willyams, & Co.	19,213	103,485 5 8
Williams, Foster, & Co.	34,064	228,389 11 5
Total	153,120	£873,436 10 6

PURCHASES at SWANSEA TICKETINGS.

Companies.	Tons.	Amount.
English Copper Company	5,592	£71,458 18 1
Freeman & Co.	2,607	35,691 16 0
P. Grenfell & Sons	5,432	76,873 14 8
Crown Copper Company	16	80 4 3
Sims, Willyams, & Co.	6,184	97,934 11 6
Vivian & Sons	12,623	147,070 10 6
Williams, Foster, & Co.	13,787	185,168 4 0
Mines Royal	204	2,334 0 0
Schneider & Co.	1,166	24,444 11 0
Total.	47,611	£641,056 10 6

CORNISH COPPER ORES.

Annual average produce, price, and standard, for eight years, from 1841 to 1848, inclusive, of copper ores sold at Cornish ticketing, with the highest and lowest prices of cake copper in each year.

Year.	Standard.	Produce.	Price.	Cake Copper—per Ton.
	£ s. d.		£ s. d.	£ £ s. d.
1841	125 1 0	7¼	6 5 0	100 to 95 0 0
1842	113 18 0	7⅜	5 12 1	96 to 83 0 0
1843	109 8 0	7½	5 10 0	88 to 78 10 0
1844	107 8 0	7⅝	5 4 9	88 to 88 3 0
1845	106 2 0	7¾	5 18 0	93 to 84 0 0
1846	102 2 0	7⅞	5 5 10	93 to 88 10 0
1847	103 11 0	8¼	5 14 1	98 to 93 0 0
1848	90 13 0	8 4/16	4 18 9	

Declared Value of Exports of British and Irish Metals for the years ending 5th January, 1847, 1848, and 1849.

	1847.	1848.	1849.
	£	£	£
Iron and Steel	4,178,026	5,265,779	4,747,009
Copper and Brass	1,558,187	1,541,868	1,272,675
Lead	147,170	179,344	117,181
Tin unwrought	107,456	159,466	143,436
Tin plates	639,223	462,889	530,061

SALES of WELSH COPPER ORES, at SWANSEA,

From 1804, to 30th June, 1848, inclusive.

	Tons.		Tons.		Tons.		Tons.		Tons.
1804	52	1811	88	1818	247	1825	1,191	1831	1,442
1805	—	1812	622	1819	90	1826	1,115	1832	3,184
1806	41	1813	442	1820	124	1827	1,140	1833	1,786
1807	68	1814	321	1821	191	1828	3,555	1834	3,336
1808	312	1815	1,079	1822	412	1829	6,076	1835	3,770
1809	240	1816	600	1823	564	1830	1,788	1836	1,698
1810	400	1817	422	1824	358				

	Tons. (21 cwt.)	Value. £	s.	d.	Av.price. £	s.	d.		Tons. (21 cwt.)	Value. £	s.	d.	Av.price. £	s.	d.
1837 ..	2,064 ..	13,384	16	6 ..	6	9	8	1843 ..	737 ..	4,260	15	6 ..	5	15	7
1838 ..	2,237 ..	14,688	8	6 ..	6	10	10	1844 ..	1,088 ..	8,479	0	6 ..	7	15	10
1839 ..	2,830 ..	18,832	16	0 ..	6	13	1	1845 ..	681 ..	3,175	14	0 ..	4	13	3
1840 ..	1,795 ..	9,747	15	6 ..	5	8	8	1846 ..	1,389 ..	6,639	13	6 ..	4	15	7
1841 ..	1,456 ..	7,020	8	6 ..	4	16	5	1847 ..	434 ..	2,378	19	6 ..	5	9	7
1842 ..	556 ..	2,728	19	6 ..	4	18	1	1848 ..	68 ..	570	17	0 ..	8	8	0

IRISH COPPER ORE, SOLD at SWANSEA,

From 1837 to 1848 inclusive, with Average Prices.

	21 cwt.	Value. £	s.	d.	Av.price. £	s.	d.		21 cwt.	Value. £	s.	d.	Av.price. £	s.	d.
1837 ..	20,436 ..	130,823	11	6 ..	6	8	0	1843 ..	16,523 ..	115,791	16	6 ..	7	0	0
1838 ..	22,705 ..	139,568	4	0 ..	6	2	11	1844 ..	19,385 ..	127,898	3	6 ..	6	12	11
1839 ..	22,290 ..	143,447	11	6 ..	6	8	8	1845 ..	18,597 ..	113,566	8	6 ..	6	2	1
1840 ..	23,412 ..	135,293	1	0 ..	5	15	6	1846 ..	17,264 ..	110,159	6	0 ..	6	7	7
1841 ..	16,538 ..	137,442	0	6 ..	8	6	2	1847 ..	14,463 ..	88,760	18	0 ..	6	2	8
1842 ..	14,030 ..	115,570	15	6 ..	8	4	8	1848 ..	14,554 ..	78,024	14	0 ..	5	7	2

EXPORTS of ENGLISH and IRISH METALS and MINERALS.

The following particulars are extracted from an account of the exports of the principal articles of British and Irish produce and manufactures in the twelve months ending on the 5th January, 1846, 1847, and 1848, as follow :—

	1846.	1847.	1848.
Coals and culm	£973,635	£971,174	£976,377
Earthenware	828,182	793,166	834,151
Glass	357,421	262,547	293,038
Hardware and cutlery	2,183,000	2,180,587	2,346,255
Machinery	904,961	1,117,470	1,228,091
Metals—Iron and steel	3,501,995	4,178,026	5,272,942
Copper and brass	1,694,441	1,558,187	1,467,498
Lead	210,974	147,170	181,771
Tin, unwrought	48,777	107,456	159,098
Tin-plates	615,729	639,223	459,265
Salt	218,302	205,005	260,591

The total amount of exports shows—in 1846, £53,298,026; in 1847, £51,227,060; and, in 1848, £50,897,790.

EXPORTS of METALS to ALL INDIA from LONDON and LIVERPOOL, For the Years 1847 and 1848.

		1847.	1848.	In.in1848.	Dec.in1848.
Spelter	*Tons*	3,244	3,019	—	225
Copper		3,553	3,652	99	—
Iron, British		10,976	20,617	9,641	—
Ditto, foreign		847	339	—	508
Tin-plates	*Boxes*	7,308	4,024	—	3,284
Lead	*Tons*	1,099	926	—	173
Steel		552	295	—	257
Quicksilver	*Bottles*	50	45	—	5

PRICE of MATERIALS in CORNWALL,

March 1, 1849.

CAST IRON.

Cylinders, Cases, Covers, Pistons, Piston-Caps, Nozzles, Air-Pumps and Covers, for Engines under 80 inches diameter, bored and turned	26s. ℔ cwt.
The aforegoing for 80-inch Engines and upwards	2s. extra.
Cylinder Bottoms, Condensers and Bottoms	20s. ,,
Ditto ditto for 80-inch Engines, and above	2s. extra.
Steam and Eduction Pipes, straight and crooked	9s. to 12s. ,,
Feed ditto ditto	8s. 6d. to 10s. 6d.
Beams, cast open	11s. ,,
Ditto, cast close	15s. ,,
Gudgeons, Troughs, Shafts, Bearing and Top Blocks, Sockets, and Saddles	9s. 6d.. ,,
Gudgeons and Shafts turned, and Bearing and Top Blocks fitted	14s. ,,
Fly Wheels, complete (cast iron only)	12s. ,,
Segments and Arms for ditto	10s. ,,
Centre Pieces for Wheels, Capstans, &c.	12s. ,,
Ditto, bored	16s. ,,
Spur Wheels, 1 cwt. and above — 4s. per cwt. extra if bored	12s. ,,
Under ditto — 4s. per cwt. extra if bored	14s. ,,
Bevil ditto — 4s. per cwt. extra if bored	14s. ,,
Ditto, under 1 cwt. — 4s. per cwt. extra if bored	16s. ,,
Cranks	10s. ,,
Ditto, bored	16s. to 22s. ,,
Hot Water Cisterns	16s. ,,
Manhole Branches and Doors	12s. ,,
Ditto, faced	17s. ,,
Fire-door Frames, Sleepers, and Fire Bars, cast open	7s. ,,
Ditto ditto ditto cast close	9s. ,,
Dampers and Frames, cast open	8s. ,,
Ditto cast close	9s. ,,
Boiler Stands	7s. ,,
Plain Pumps, 4-inch bore and above, and Windbores	8s. ,,
Short ditto	9s. ,,
Hollow Stools, for Beams	14s. ,,
Working Barrels	15s. ,,
Ditto, under 4 inches	18s. ,,
Plunger, Knee, and H-pieces, and Clack Seat Pieces, under 4 feet long	15s. ,,
Doors and Bottoms for ditto	7s. ,,
Ditto, cast close	8s. 6d. ,,
Clack Seat Pieces, with doors	11s. ,,
Plunger Poles for Shaft-work, 6 inches diameter, and above	24s. ,,
Ditto, under 6 inches	26s. ,,
Stuffing Boxes and Glands, bored	20s. ,,
Valves, Seats, and Clacks	10s. ,,
Ditto ditto ditto, turned	15s. ,,
Air Pipes, 4 inches diameter, and 6 feet long	8s. 6d. each.
Whim Shieves, 4 feet diameter, light pattern	16s. ,,
,, 3 feet 6 inches ,,	14s. ,,
,, 3 feet ,,	12s. ,,
,, 2 feet ,,	8s. ,,
,, 1 foot 6 inches ,,	7s. 6d. ,,
Capstan and Whim Shieves, all sizes, heavy pattern	9s. ℔ cwt.

CAST IRON—*continued.*

Flat Rope Sheives	9*s.* ℔ cwt.
Ditto, bored	12*s.* ,,
Tram Wheels	8*s.* ,,
Ditto, bored	12*s.* ,,
Tram Saddles	10*s.* ,,
Stamp Heads	7*s.* ,,
Ditto, with long shanks	8*s.* 6*d.* ,,
Cams for Stamp Axles	8*s.* ,,
Bucking Plates	7*s.* ,,
Crushing Rolls, cast in sand	8*s.* ,,
Ditto, cast in chills	9*s.* ,,
Mandrills	15*s.* ,,
Ditto, turned	21*s.* ,,
Pillars	10*s.* to 11*s.* ,,
Grate Plates, open	9*s.* ,,
Ditto, close	12*s.* ,,
Open-top Water Pipes	11*s.* ,,
Iron Borings	6*s.* ,,
Ditto, fine	7*s.* ,,
Feed-pole Cases, with Stuffing Boxes and Glands, bored	25*s.* ,,
Kibble Moulds	11*s.* ,,
Shaft Pulleys	8*s.* 6*d.* ,,
Ditto, bored, 4*s.* per cwt. extra.	
Sampling Plates	12*s.* ,,
Frames for Crushers	11*s.* ,,
Anvil Blocks	10*s.* ,,
Chain Guides	9*s.* ,,
Stamp Guides	12*s.* ,,
Dressing Plates, and Backs for Grates, cast open	9*s.* ,,
Ditto ditto, cast close	13*s.* ,,
Shoes for Drags	9*s.* 6*d.* ,,
Hawse Pipes	20*s.* ,,
Plough Chips	12*s.* ,,
Barrow Wheels	12*s.* ,,
Furnaces, in green sand	12*s.* ,,
Ditto, in loam	16*s.* ,,
Wheeland Pipe Boxes	2*d.* ℔ lb
Hearth Eyes	11*s.* ℔ cwt.
Block Tin and Ingot Moulds	14*s.* ,,
Hammers, Anvil Faces, and Bits	12*s.* ,,
Clock and Sash Weights	9*s.* ,,
Grate Castings	14*s.* to 16*s.* ,,
Paul Plates	16*s.* ,,
Weights adjusted—¼ cwt. 7*s.* 6*d.*—½ cwt. 4*s.* 3*d.*—14 lb 2*s.* 3*d.*—7 lb 1*s.* 8*d.*—4 lb 1*s.* 3*d.*—2 lb 1*s.* 2*d.*—1 lb 9*d.*—½ lb 8*d.*	
Single Screw Valve Boxes, complete, with Brass Valve-spill and Cross-bar, viz.:—4 in. £4. 10*s.*—3½ in. £3. 15*s.*—3 in. £3. 3*s.*—2½ in. £3.—2 in. £2. 10*s.* each.	
Boring Working Barrels	5*s.* ℔ inch.
Turning Plunger Poles	7*s.* ,,

WROUGHT IRON.

Plain Cylindrical Boilers, made of Best Plates and Best Rivet Iron	17*s.* ℔ cwt.
Whim Kimbles, hammered iron	18*s.* ,,
Ditto, rolled	16*s.* ,,
Winze Kibbles	8*s.* each.
Washing Tubs	5*s.* ,,
Tapered Rod Plates, hammered from Scraps, 6 inches wide and under, in slabs	13*s.* ℔ cwt.
,, 7 inches wide	14*s.* ,,
,, 8 inches wide	15*s.* ,,

WROUGHT IRON—*continued.*

Tapered Rod Plates, hammered from Scraps, 6 inches wide and under, fitted in length and holes bored, complete	16*s.* ℔ cwt.
,, with square holes, complete	17*s.* ,,
,, 7 inches wide, holes bored, complete	17*s.* ,,
,, ditto, square holes, complete	18*s.* ,,
,, 8 inches wide, holes bored, complete	18*s.* ,,
,, ditto, square holes, complete	19*s.* ,,
Miners' Shovels	27*s.* ,,
Steel Point ditto	47*s.* ,,
Valve Iron	15*s.* ,,
Faggoted Iron, single	11*s.* ,,
Ditto, double	13*s.* ,,
Axle Arms and Shear Moulds	13*s.* ,,
Grate Plates, rough	16*s.* ,,
Ditto, middle hole cut	22*s.* ,,
Ditto, finished	26*s.* ,,
Furnace Bottoms	20*s.* ,,
Flat Thread Tops and Nuts	4*d.* ℔ lb
Piston and Air Pump Rods, complete	8*d.* to 1*s.* ,,
Piston Rings, turned	10*d.* to 1*s.* ,,
Loops	5*d.* to 8*d.* ,,
Outer Connexion Caps	23*s.* ℔ cwt.
Chain, made of Best Scrap Iron, $\frac{1}{2}$ and $\frac{9}{16}$ inch	21*s.* ,,
,, ,, $\frac{5}{8}$ inch	22*s.* ,,
,, ,, $\frac{11}{16}$ inch	23*s.* 6*d.* ,,
,, ,, $\frac{3}{4}$ inch	25*s.* ,,
,, ,, $\frac{13}{16}$ inch	26*s.* ,,
,, ,, $\frac{7}{8}$ inch	27*s.* ,,
Best Boiler Plate, Shropshire	11*s.* ,,
Kibble Plates, hammered	15*s.* ,,
Ditto, rolled	14*s.* ,,
Hoop Iron	
Sheet Iron, single	
,, double	
,, treble	
Nail Rods	
Iron—Common	
,, Tough	
,, Crown, S.C.—$\frac{5}{16}$ and $\frac{3}{8}$ inch	
,, ,, ,, $\frac{7}{16}$ inch	
,, ,, ,, $\frac{1}{2}$ inch	

BRASS.

Best Composition Metal Plunger Poles and Linings for Air Pumps, bored and turned	1*s.* 7*d.* ℔ lb
Covers, Buckets, &c., bored and turned	1*s.* 6*d.* ,,
Bearing and Bucket Brasses	1*s.* ,,
Ditto ditto, bored	1*s.* 3*d.* ,,
Working Barrels, bored	1*s.* 6*d.* ,,
Steam Valves and Seats	2*s.* 3*d.* ,,
Ditto, double beat	2*s.* 6*d.* ,,
Large Bushings	2*s.* and upwards.
Small Brasses and Bearings for Parallel motion	1*s.* 8*d.* to 1*s.* 10*d.*

NAILS.

Spikes
3*s.* 4*d.*
2*s.* 6*d.*
2*s.* 0*d.*
28 lb Flat Point
22 lb ditto
18 lb ditto

NAILS—*continued.*

16 lb Flat Point
14 lb ditto
9 lb ditto
3 lb Rose
2½ lb ditto
2¼ lb ditto

STEEL.

Gad, or H-2
Hoop-L Blister
Best Double converted

TIMBER.

Quebec Yellow Pine
„ Red Pine, to 30 feet
„ Red Pine, above 30 feet
Lower Ports Yellow Pine
„ Red Pine, to 30 feet
„ Red Pine, above 30 feet
Balk—Dram and Longsound Timber
Birch
American Elm, under 40 feet long
Oak—under 30 feet.
„ 30 feet to 50 feet
„ 50 feet to 60 feet
„ 60 feet to 80 feet
„ 80 feet, and above

MISCELLANEOUS ARTICLES.

Cordage—Round Ropes
„ Flat ditto
„ White Yarn
„ Hemp
Lead—Sheet
„ Pig
„ White Ground
„ Red ditto
Tallow
Oil—Rape
„ Linseed
Tar
Pitch
Laths—Heart
„ Sap
Slate—Scantle
„ Common
Lime
Bricks—Bridgewater
„ Flintshire
„ Stourbridge
Pantiles
Grindstones

IMPORTS OF METALS for 1846, 1847, and 1848, from Parliamentary Returns made up to 5th January, 1849.

	1846.										1847.	
	Month ending 5th Feb.	March.	April.	May.	June.	July.	August.	Sept.	Oct.	Nov.	Dec.	Jan.	Total.
Copper ore .... tons	3,456	4,914	3,992	3,756	2,411	6,226	4,196	5,370	6,703	2,090	4,481	4,029	51,624
— unwrought cwts.	..	55	171	198	55	1,529	60	566	5,367	2	64	1,234	9,331
Iron in bars.... tons	233	650	440	1,687	2,015	5,539	2,691	5,544	4,485	2,428	2,733	6,199	34,633
Steel, u. w.... cwts.	160	266	3,367	3,226	304	1,008	2,402	2,094	997	872	1,610	2,160	18,466
Lead, pig, &c... tons	404	430	365	367	374	638	619	866	1,349	727	557	1,166	7,863
Spelter ..... ,,	56	94	448	799	906	1,026	206	468	787	371	865	1,220	7,245
Tin in blocks.. cwts.	992	705	2,245	1,558	2,658	669	548	4,007	1,415	484	130	4,896	20,306
Quicksilver .... lbs.	169,076	..	..	187,836	571,095	..	..	227,224	190,005	229,009	929	265,399	1,840,583

	1847.										1848.	
Copper ore .... tons	930	2,385	3,499	2,145	4,917	4,962	2,776	3,737	3,301	2,502	3,886	6,452	41,491
— unwrought cwts.	..	2,721	385	..	..	808	364	..	1,073	..	2,731	2,182	10,265
Iron in bars.... tons	758	7	224	538	2,040	1,574	6,058	5,533	6,351	3,181	3,044	4,010	33,317
Steel, u. w.... cwts.	953	..	628	..	..	3,848	2,002	2,217	1,068	1,469	478	433	13,097
Lead, pig, &c... tons	6	612	246	74	328	126	112	213	755	443	251	766	3,932
Spelter ..... ,,	33	35	251	328	879	2,313	1,344	2,793	1,957	1,487	843	505	12,769
Tin in blocks.. cwts.	..	1,455	2,850	512	1,713	1,119	5,032	2,751	904	3,412	..	3,561	23,307
Quicksilver .... lbs.	396,742	76	..	209,912	220,031	181,044	264,096	610,091	..	248,743	402,471	9,651	2,542,857

	1848.										1849.	
Copper ore .... tons	1,524	5,039	5,672	2,876	5,415	5,965	5,182	2,612	5,656	1,687	3,397	..	14,167
Do. 11 & 12 Vict...	..	..	..	..	..	..	..	..	..	..	..	5,122	35,981
— unwrought cwts.	..	..	..	226	..	2,607	1,387	4,148	..	573	1,068	245	10,255
Iron in bars.... tons	1,070	323	578	716	773	2,784	2,546	2,877	3,771	3,314	2,862	1,787	23,396
Steel, u. w.... cwts.	..	2,307	300	13	..	897	573	206	654	405	79	1,064	6,755
Lead, pig, &c... tons	..	253	101	33	603	252	550	387	383	225	205	516	3,507
Spelter..... ,,	84	18	468	285	2,427	1,772	1,301	1,262	971	1,106	1,428	2,302	13 423
Tin in blocks.. cwts.	..	16	706	336	..	291	..	..	1,310	1,891	929	1.253	6,733
Quicksilver .... lbs.	..	..	139,801	247,561	150,101	..	210,739	462,933	428,514	..	..	58,024	1,562,663

EXPORTS OF METALS for the years 1846, 1847, and 1848, from Parliamentary Returns up to 5th January, 1849.

	1846.										1847.		
	Feb.	March.	April.	May.	June.	July.	August.	Sept.	Oct.	Nov.	Dec.	Jan.	Total.
Copper ore .... tons													
— unwrought cwts.	79	..	143	..	73	153	..	..	1,147	5	2,482	2,190	6,272
Iron in bars.... tons	360	295	534	387	225	514	405	772	90	133	279	99	4,094
Steel, u. w.... cwts.	1,467	442	250	2,207	831	1,412	1,820	4,914	1,867	1,640	804	843	18,497
Lead in pigs .. tons	187	283	461	568	658	220	625	711	383	141	227	236	4,700
Spelter ..... ,,	346	472	546	1,825	555	580	215	70	20	129	2	15	4,784
Tin in blocks.. cwts.	1,009	1,173	2,832	3,447	1,872	1,557	1,743	2,261	2,045	474	1,022	1,002	21,038
Quicksilver .... lbs.	110,345	35,933	140,376	111,594	171,533	123,521	103,131	131,901	270,195	97,508	150,583	101,381	1,507,519

	1847.										1848.		
Copper unwrght cwt	466	..	..	377	500	1,032	1,878	177	..	898	5	2,226	8,043
Iron in bars.... tons	251	140	1,049	616	595	462	328	523	184	378	153	374	5,053
Steel, u. w.... cwts.	5,100	226	1,242	666	1,878	841	630	1,490	816	440	246	342	13,357
Lead in pigs .. tons	199	147	269	603	306	247	234	369	415	267	192	193	3,402
Spelter ..... ,,	11	2	71	87	280	252	767	357	515	289	341	374	3,346
Tin in blocks.. cwts.	1,382	537	583	646	1,841	622	747	966	1,227	299	1,037	872	11,471
Quicksilver .... lbs.	159,793	92,292	238,026	103,281	149,839	180,204	103,203	143,351	89,268	27,926	151,980	138,857	1,518,164

	1848.										1849.		
Copper ore .... tons													
— unwrought cwts.	250	657	..	..	..	..	..	180	..	218	500	1,820	3,726
Iron in bars .. tons	235	211	220	454	172	247	494	252	499	312	188	149	3,432
Steel, u. w.... cwts.	247	602	858	..	312	1,120	331	20	1,932	1,550	934	1,893	9,779
Lead in pigs .. tons	60	102	735	535	850	381	108	360	155	373	60	31	3,748
Spelter ..... ,,	52	151	166	217	381	821	662	249	551	87	141	318	3 777
Tin in blocks.. cwts.	555	1,024	1,374	839	634	1,382	311	398	1,313	216	147	146	8,341
Quicksilver .... lbs.	278,991	58,869	47,578	149,938	78,003	56,851	56,033	33,699	28,093	26,609	62,946	28,119	905,650

IMPORTS of FOREIGN COPPER and COPPER ORE into the United Kingdom from 1832 to 1848 inclusive.

FRANCE.

Year end. Jan. 5.	Copper unwrought	Part wrought.	Plates and coin.	Old, for remanufacture.	Ore.	Copper Manufactures.	
						Weight.	Value.
	T. ct.q.lb.	T. ct.q.lb.	T. ct.q.lb.	T. ct.q.lb.	T. c.qt.lb.	T. ct.q.lb.	£ s. d.
1832	—	—	0 0 0 2	0 8 0 25	—	—	2,258 0 6
1833	—	—	0 2 1 22	—	—	—	2,883 18 6
1834	—	—	0 0 0 10	—	—	—	2,345 2 10
1835	0 0 0 2	—	—	—	—	0 6 3 4	1,555 0 6
1836	—	—	0 2 0 11	—	—	1 13 2 2	2,287 16 0
1837	—	—	—	—	—	—	5,914 16 4
1838	—	—	0 1 1 2	—	—	—	1,501 13 0
1839	—	0 0 2 15	0 0 1 20	—	—	0 0 0 6	2,543 19 0
1840	—	0 1 2 4	0 0 3 14	2 7 2 2	—	—	1,897 14 0
1841	0 1 0 0	0 0 1 21	0 0 0 15	—	0 2 0 0	—	1,780 3 6
1842	0 10 0 0	0 1 1 23	0 0 0 4	—	0 1 1 25	—	1,451 0 6
1843	—	—	0 0 1 14	—	2 2 1 14	—	1,936 6 6
1844	21 13 1 15	—	0 0 0 5	0 13 3 12	0 0 0 12	—	2,788 4 10
1845	—	—	0 0 0 14	1 12 3 14	0 2 1 19	1 15 0 10	2,348 18 11
1846	—	—	0 0 2 14	—	3 15 0 0	—	2,394 19 2
1847	—	—	—	1 2 1 5	118 4 0 0	—	3,059 2 7
1848	—	—	0 0 2 3	0 9 2 20	32 4 0 12	0 1 1 4	2,841 10 0

GERMANY.

1834	0 9 3 15	0 2 3 19	0 13 3 14	0 10 2 12	—	—	1,518 4 0
1835	—	0 1 3 11	—	1 8 2 10	—	0 4 3 8	2,161 10 4
1836	0 0 0 21	0 3 2 3	0 0 0 1	3 9 3 5	—	5 19 1 20	2,903 19 6
1837	—	2 11 3 8	—	7 4 3 19	8 8 2 25	28 2 2 0	2,061 5 2
1838	—	0 3 0 7	—	0 2 2 14	2 0 19	12 6 0 22	1,211 13 4
1839	—	0 15 2 8	0 0 0 22	0 5 3 17	125 18 0 27	1 4 2 19	1,356 8 2
1840	—	0 5 2 14	—	2 1 2 6	—	3 15 0 0	313 12 0
1841	—	—	0 0 1 25	0 19 0 20	—	10 17 1 7	327 2 6
1842	—	—	0 0 0 7	0 3 3 21	33 0 0 0	28 18 0 21	249 11 0
1843	—	0 0 2 23	—	—	—	12 14 3 20	557 7 6
1844	—	0 1 3 7	0 0 3 12	1 10 0 0	—	5 3 0 2	101 6 6
1845	—	0 6 2 23	1 14 3 8	4 12 3 8	—	6 6 1 16	204 0 0
1846	—	—	3 13 0 10	1 11 0 24	0 1 0 0	10 15 1 17	295 0 0
1847	—	1 0 0 19	0 17 2 7	—	—	11 14 2 21	402 4 0
1848	0 1 0 0	0 1 0 9	0 18 2 18	5 18 2 25	—	24 0 2 24	520 0 6

ITALY.

1832	—	—	0 0 0 2	—	—	—	7 0 0
1833	—	—	0 0 1 23	—	—	—	2 5 0
1834	—	—	—	—	—	—	6 5 0
1835	—	—	0 0 0 20	—	2 7 1 20	—	9 5 0
1836	—	—	—	0 2 3 14	—	1 2 0 6	1 5 0
1837	13 13 1 19	—	—	—	—	0 17 0 22	24 5 0
1838	41 1 0 23	—	—	—	16 11 2 2	0 4 1 9	13 0 0
1839	—	—	—	—	—	—	3 0 0
1840	4 15 3 20	—	0 0 1 7	—	30 19 0 13	—	13 18 0
1841	0 5 2 11	—	0 0 3 20	—	102 13 1 14	—	1 19 0
1842	—	—	0 0 2 16	—	245 10 0 24	—	28 3 0
1843	—	—	0 0 0 2	—	324 9 1 4	—	—
1844	0 0 2 14	—	0 0 1 0	—	365 17 3 24	2 14 0 17	159 0 0
1845	0 8 1 26	—	—	0 3 1 24	558 10 3 8	0 14 2 3	10 10 0
1846	—	—	0 0 1 5	—	640 11 2 14	1 19 0 1	58 12 6
1847	—	—	0 0 1 23	0 11 2 8	576 16 2 2	1 6 3 6	37 0 0
1848	—	—	—	2 11 3 16	207 2 3 3	0 10 1 13	130 0 0

Russia.

Year end. Jan. 5.	Copper unwrought	Part wrought.	Plates and coin.	Oil, for remanufacture.	Ore.	Copper Manufactures. Weight.	Copper Manufactures. Value.
	T. ct. q. lb.	T. ct. q. lb.	T. ct. q. lb.	T. ct. q. lb.	T. ct. q. lb.	T. ct. q. lb.	£ s. d.
1832	—	—	—	0 0 3 12	—	—	—
1833	—	—	—	—	—	—	—
1834	5 1 2 9	— 18	—	0 5 0 0	0 0 0 18	—	—
1835	5 1 0 23	26 19 1 14	—	—	—	—	7 10 0
1836	9 1 2 4	16 1 1	—	—	—	—	41 15 0
1837	0 0 3 22	—	—	—	0 3 1 11	—	4 0 0
1838	—	—	—	0 0 3 20	—	—	5 0 0
1839	—	—	—	1 1 3 5	—	—	—
1840	—	—	—	0 3 0 23	—	—	—
1841	—	—	—	—	—	—	3 0 0
1842	—	—	—	—	—	—	22 0 0
1843	—	—	—	0 0 2 24	—	—	46 15 0
1844	3 4 1 8	—	0 0 0 1	1 3 0 7	—	0 17 0 16	2 17 6
1845	—	—	—	—	—	—	96 15 0
1846	—	—	1 5 2 14	—	—	1 12 2 16	62 10 0
1847	32 2 3 2	—	—	0 12 3 4	—	—	3 0 0
1848	—	—	—	0 1 0 0	—	—	14 15 0

Holland.

1834	—	—	0 2 0 25	—	—	—	8 0 0
1835	—	—	—	0 2 0 1	43 18 0 20	4 5 2 25	1 10 0
1836	0 0 0 7	—	0 0 0 4	—	—	23 3 2 23	59 0 0
1837	0 17 3 16	0 1 3 12	—	0 0 3 21	57 8 0 0	9 2 0 16	72 1 6
1838	—	—	—	—	35 16 0 0	10 18 0 13	24 19 6
1839	—	—	0 0 0 7	—	38 0 0 0	—	59 5 0
1840	1 14 2 7	0 0 1 12	—	0 0 3 0	50 0 0 0	—	100 0 0
1841	—	—	—	—	40 0 0 0	0 1 0 20	65 3 0
1842	—	—	0 0 0 14	—	90 1 0 0	3 0 3 18	512 3 0
1843	—	—	—	—	13 3 2 0	23 17 2 5	288 6 0
1844	—	0 0 1 6	—	—	63 18 2 14	33 2 3 6	114 10 0
1845	—	0 1 2 23	0 0 2 0	—	89 16 3 25	15 8 0 15	296 5 0
1846	—	0 1 0 22	—	—	110 5 3 11	27 9 3 3	670 15 0
1847	—	—	—	0 13 2 9	2 12 3 3	32 12 0 10	1,033 17 0
1848	—	0 1 0 18	—	—	76 10 0 0	14 10 0 3	221 1 0

Norway.

1835	—	—	—	0 2 1 5	116 5 2 10	—	—
1836	—	—	—	—	507 11 0 13	—	—
1837	—	—	—	—	182 17 1 16	—	—
1838	—	—	—	—	—	—	—
1839	—	—	—	—	—	—	—
1840	—	—	—	0 4 2 17	—	—	—
1841	—	—	73 17 0 11	—	57 8 2 14	—	—
1842	—	—	—	1 18 1 25	—	—	—
1843	79 9 1 10	—	50 10 0 5	—	89 6 1 0	—	—
1844	—	45 14 3 22	23 12 1 2	—	5 10 1 20	—	—
1845	140 5 3 6	—	—	—	3 18 1 9	—	—
1846	69 9 2 13	—	—	—	4 7 2 21	—	—
1847	—	69 19 0 4	—	—	—	—	—
1848	32 17 3 27	—	—	0 0 2 19	0 0 1 0	—	334 10 0

SWEDEN.

Year end. Jan. 5.	Copper unwrought	Part wrought.	Plates and coin.	Old, for remanufacture.	Ore.	Copper Manufactures.	
						Weight.	Value.
	T. ct.q.lb.	T. ct.q.lb.	T. ct.q.lb.	T. ct.q.lb.	T. ct.q.lb.	T. ct.q.lb.	£ s. d.
1832	—	—	—	—	714 14 0 0	—	—
1833	—	0 0 1 17	—	—	366 6 0 22	—	10 0 0
1834	—	—	—	—	789 18 2 9	—	—
1835	—	—	—	—	535 0 3 16	—	—
1836	—	—	—	—	493 9 0 26	—	—
1837	11 14 2 11	—	—	—	1,995 8 3 18	—	—
1838	—	—	—	1 16 2 3	1,469 10 0 0	—	—
1839	45 7 3 21	—	—	—	718 15 2 11	—	—
1840	277 11 2 8	—	—	—	501 18 0 0	—	2 0 0
1841	161 18 1 14	—	—	—	28 10 0 0	—	—
1842	126 6 0 3	—	—	—	16 12 0 14	—	5 0 0
1843	55 11 2 21	—	—	0 6 1 8	—	—	—
1844	—	—	—	—	—	—	0 5 0
1845	—	—	—	—	—	—	—
1846	—	2 0 0 15	—	—	—	—	—
1847	—	—	—	—	—	—	—
1848	—	—	—	0 7 3 24	—	—	—

SUMMARY.

Imports of Copper and Copper Ore from the whole of Europe into the United Kingdom from 1832 to 5th January, 1848.

Copper unwrought, in bricks or pigs, rose copper, and cast copper.	Part wrought—bars, rods, or ingots, hammered or raised.	Plates and coin.	Old, for remanufacture.	Ore.	Copper Manufactures.	
					Entered by Weight.	Entered by Value.
T. ct.q.lb.	T. ct.q.lb.	T. ct.q.lb.	T. ct.q.lb.	T. ct.q. lb.	T. ct.q.lb.	£ s. d.
*23 16 0 25	0 1 3 11	0 0 1 11	1 14 0 5	714 14 0 4	—	2,920 13 4
8 11 0 26	0 4 1 0	0 3 1 0	5 11 2 24	400 4 2 16	—	4,589 16 10
11 8 0 6	0 2 3 19	0 16 0 22	2 6 3 23	880 18 2 6	—	3,878 11 10
27 0 1 16	28 6 0 1	0 0 0 22	2 1 3 7	851 10 3 24	4 17 1 9	3,739 14 10
17 15 0 23	16 4 3 17	0 2 0 16	5 10 1 13	1,065 9 1 21	31 18 2 23	5,326 2 0
334 17 2 18	4 15 1 7	0 0 0 1	7 5 3 12	2,173 16 2 25	38 1 3 0	8,081 0 0
177 2 3 14	0 3 0 7	0 1 1 4	3 12 2 9	1,522 0 2 1	23 8 2 16	2,889 11 4
55 7 3 21	0 16 0 23	0 0 3 13	1 12 1 13	882 13 3 21	1 8 2 3	4,002 17 2
287 6 0 13	0 7 2 2	0 1 0 21	7 15 1 12	582 17 2 21	3 15 0 0	2,336 3 6
162 4 3 25	0 0 1 21	74 0 1 26	2 8 2 3	226 11 1 3	10 18 1 27	2,190 18 0
126 16 0 3	0 1 1 23	0 0 3 18	4 2 0 20	385 4 3 7	31 19 0 11	2,274 17 6
141 8 3 2	0 0 2 23	50 10 2 12	0 16 3 11	394 18 3 8	36 12 1 25	2,838 0 0
28 15 0 5	86 6 1 0	54 5 1 20	4 15 0 22	672 18 3 0	41 17 0 13	3,217 1 4
140 14 1 4	0 8 1 18	1 15 2 4	6 10 3 11	674 5 1 20	35 18 3 1	2,990 18 11
69 10 0 3	2 1 3 20	5 0 2 27	1 11 1 15	860 18 2 26	49 11 0 15	3,634 17 8
44 9 0 1	70 19 0 22	0 18 0 2	3 11 0 8	715 17 2 16	49 2 1 2	4,669 9 7
194 0 0 17	70 7 0 6	59 18 0 13	6 10 0 12	316 6 2 5	42 15 1 0	4,222 11 6

* In this table the returns are also made up for the years 1832-48.

DIVIDENDS PAID IN BRITISH MINES.

In TWELVE MONTHS, ending Dec. 31, 1847.

Mines.	Total Div.	Div. per Sh.	Paid per Sh.	Mk. Val. per Sh.
	£	£	£	£
East Wheal Rose	34,560	270	50	1,300
Carn Brea	20,000	20	15	100
Devon Great Consols ..	15,360	15	1	200
Wheal Seton	11,880	120	214	1,200
South Francis	9,796	79	160	200
South Caradon	7,680	60	5	400
Wheal Margaret	6,720	60	10	250
Treviskey and Barrier....	5,910	48	130	150
United Mines	2,500	25	300	250
Treleigh Consols	4,500	18s.	6½	4
West Caradon	4,864	£19	20	100
Par Consols	3,072	—	900	1,000
Stray Park	4,000	4	14	25
Callington	3,000	3	19	35
Great Consols	3,500	35	1,000	400
Wheal Friendship ..	2,560	—	—	—
North Roskear	2,450	35	10	300
East Crofty	1,880	20	280	125
Levant	1,280	—	—	90
Tresavean	1,968	12½	10	200
Trethellan	1,200	10	5	15
Trehane	1,280	5	2	26
North Pool	1,000	10	45	500
Balleswidden	933	—	9	18
West Providence	704	2½	1	20
Wheal Spearn	700	—	10	75
Wheal Sisters	1,024	4	20	20
Wheal Vyvyan	552	2½	—	60
Wheal Franco	388	3	27	80
Wheal Bal	120	1	5½	20
Total ..	155,361			

Note.—In the year 1847 the dividends paid by thirty mines amounted to £155,361; this year only twenty-two mines have paid, and the amount is £129,024; of these twenty-two Bedford United and South Basset did not pay in 1847—making, therefore, ten mines in the list of 1847 not in that of the present year; viz., Tresavean, Great Consols, East Wheal Crofty, Levant, Callington, Wheal Sisters, Wheal Vyvyan, Wheal Franco, Wheal Bal, and Balleswidden.

In TWELVE MONTHS, ending Dec. 31, 1848.

Mines.	Total Div.	Div per Sh.	Paid per Sh.	Mk. Val. per Sh.
	£	£	£	£
Devon Great Consols ..	30,720	30	1	250
East Wheal Rose.. ..	25,500	200	50	550
Carn Brea	14,000	14	15	90
Par Consols	12,800	100	900	800
Wheal Seton	8,415	85	150	750
North Pool	7,750	77½	45	500
South Francis	5,045	45	160	240
Wheal Margaret	3,136	28	10	250
South Caradon	3,840	30	5	400
United Mines	1,000	10	—	400
Wheal Friendship ..	2,240	—	—	—
West Caradon	2,460	10	20	130
Bedford United	2,000	½	2½	3
Treviskey and Barrier ..	2,180	20½	130	60
North Roskear	1,620	13	10	200
Trehane	1,472	5½	2	30
Trethellan	1,200	10	20	15
South Basset	1,280	10	—	140
Treleigh Consols ..	1,000	¼	6½	2
Stray Park	500	¼	6½	18
West Providence	409	1½	1	11
Wheal Spearn	256	2	10	—
Total ..	129,024			

DIVIDENDS PAID on FOREIGN MINES in 1848.

	Dividends.	Per Sh.	Price.
	£	£	£
St. John del Rey ..	13,650	1½	19
United Mexican ..	10,703	5	4
Cobre Copper	10,000	1	18

Total amount, £34,443. 10s.

Prices of the following on the 31st December of each year.

	1841.	1842.	1843.	1844.
Spelter ..... *per ton*	£38 0 to £39 0	£27 10 to £28 0	£22 5 to £22 10	£22 12 6 to £22 15
English Bar Iron.....	6 15 —	5 15 to 5 10	5 0 —	6 15 0 —
Pig Iron, in Wales	3 15 to 4 0	3 15 —	3 5 —	4 0 0 —
,, at Glasgow	3 0 to 3 5	2 7 6 to 2 10	2 3 —	3 2 6 —
Swedes Iron	13 10 —	11 10 0 to 12 0	10 10 —	10 0 0 —
Swedish Keg Steel	19 10 —	£18	17 10 —	16 0 0 —
Copper, Eng. Sheathing.. *per lb.*	11½*d.*	9½*d.*	9⅝*d.*	9½*d.*
,, ,, Cake..... *per ton*	£96 to £98	£84	£86	£84
Tin, English Block ....*per cwt.*	78*s.*	£63 to £65	70*s.*	71*s.*
,, Foreign Banca	74*s.* to 75*s.*	67*s.* 6*d.*	70*s.* to 72*s.*	65
Straits.....	69 to 70	60*s.* to 61*s.*	70*s.*	63
Tin Plates, IC.....*per box*	28 to 32 6*d.*	26 to 29	23*s.* 6*d.* to 27*s.*	25*s.* to 31*s.*
Lead, English Pig .....*per ton*	£20	£17 5 to £17 10	£17 10	£16 15 —
,, Spanish	£20 to £20 5	17 5 —	16 10	16 0 to £16 10

	1845.	1846.	1847.	1848.
Spelter .....*per ton*	£20 10 0 to £21 0	£19 12 6 to £19 15	£19 10 to £20 0	£15 0 0 —
English Bar Iron.....	9 15 0 —	10 0 0 —	8 5 to 8 10	6 0 0 to £6 5
Pig Iron, in Wales	5 0 0 to 5 15	4 5 0 to 5 5	3 5 to 4 10	3 15 0 to 4 5
,, at Glasgow	4 2 6 to 4 5	3 17 6 to 4 0	2 5 to 2 8	2 7 6 to 2 8
Swedes Iron	11 10 0 to 12 0	11 10 0 —	11 5 —	11 0 0 to 12 0
Swedish Keg Steel	15 0 0 —	15 0 0 to 15 10	14 0 —	13 10 0 to 14 0
Copper, Eng. Sheathing.. *per lb.*	10½*d.*	10*d.*	11*d.*	9*d.*
,, ,, Cake..... *per ton*	£93	£88 10	£98	£79 10
Tin, English Block ....*per cwt.*	103*s.*	98*s.*	82*s.*	78½*s.*
,, Foreign Banca	92	102	84	86
Straits.....	91	98	80	82
Tin Plates, IC.....*per box*	29*s.* to 33*s.*	27*s.* to 33*s.*	23*s.* to 30*s.*	26*s.* to 30*s.*
Lead, English Pig .....*per ton*	£19 10	£1° 10	£17 15 —	£16 0 to £16 5
,, Spanish	18 10	17 10	17 0 to £17 5	14 15 to 15 10

ABSTRACT of the DUTY of PUMPING-ENGINES in CORNWALL, from 1822 to 1843 inclusive.

Year.	Number of engines reported.	Average duty.	BEST ENGINE.			
			Name of mine.	Description.	Engineers.	Highest duty.
1822	52	28,000,000	Wheal Abraham.	Double cylinder.	Woolf.	47,200,000
1823	52	28,200,000	Do.	Do.	Do.	51,000,000
1824	49	28,300,000	Polgooth.	80-in. cylinder.	Sims.	46,900,000
1825	56	32,000,000	Do.	Do.	Do.	54,000,000
1826	51	30,500,000	Wheal Vor.	Do.	Sims& Richards	50,000,000
1827	51	32,100,000	Wheal Towan	Do.	Grose.	62,200,000
1828	57	37,000,000	Do.	Do.	Do.	87,000,000
1829	53	41,700,000	Do.	Do.	Do.	82,000,000
1830	56	43,300,000	Do.	Do.	Do.	77,000,000
1831	58	43,400,000	Do.	Do.	Do.	77,700,000
1832	59	45,000,000	Wheal Vor.	Do.	Richards.	91,400,000
1833	56	46,600,000	Do.	Do.	Do.	88,500,000
1834	52	47,800,000	Fowey Consols.	Do.	West.	97,000,000
1835	51	47,800,000	Do.	Do.	Do.	95,800,000
1836	61	46,600,000	Wheal Darlington.	Do.	Eustis.	95,400,000
1837	58	47,000,000	Fowey Consols.	Do.	West.	85,000,000
1838	61	50,000,000	Wheal Darlington.	Do.	Eustis.	78,100,000
1839	52	55,000,000	Fowey Consols.	Do.	West.	77,800,000
1840	54	54,000,000	Wheal Darlington.	Do.	Eustis.	81,700,000
1841	56	54,700,000	United Mines.	85-in. cylinder.	Hocking&Loam	[1]01,900,000
1842	49	53,800,000	Do.	Do.	Do.	[1]97,500,000
1843	36	60,000,000	Do.	Do.	Do.	96,100,000

AVERAGE DUTY of CORNISH STEAM-ENGINES, from the Monthly Reports.

1848.	No. of pumping Engines.	Quantity of Coal consumed.	Water lifted 10 fathoms high.	Average duty.*
		Tons.	Tons.	lbs.
January	27	2,285	22,000,000	54,000,000
February ..	31	2,540	25,000,000	57,000,000
March	28	3,523	33,000,000	54,000,000
April	27	2,668	25,000,000	53,000,000
May	27	2,253	22,000,000	54,000,000
June	27	2,544	24,000,000	54,000,000
July	26	1,917	18,000,000	54,000,000
August	26	1,780	16,000,000	53,000,000
September ..	25	2,038	18,000,000	52,000,000
October	25	1,618	14,000,000	53,000,000
November ..	26	2,168	19,000,000	50,000,000
December ..	25	1,923	17,000,000	50,000,000

* The average duty in fifth column gives the number of lbs. lifted one fathom high by the consumption of a bushel of coal.

CORNISH STEAM-ENGINES.

(From the *Cornish Engine Reporter.*)

			Month ending 20 July.	August.	Sept.	Oct.	Nov.	Dec.
Pumping-engines.	Number reported		23	24	24	24	24	24
	Average load per square inch on piston, in lbs.		11·9	11·4	11·5	11·8	12·5	12·7
	Average number of strokes per minute		4·8	4·8	5·3	5·2	5·3	5·6
	Gallons of water drawn per minute		3,773	3,980	3,772	4,031	4,373	4,000
	Average duty—being million lbs. lifted 1 foot high by the consumption of 1 cwt. of coals		61·1	59·5	67·2	63·4	64·9	63·9
	Actual horse-power employed		710·8	740·1	725·8	787·8	845·8	814·6
	Average consumption of coals per horse-power per horse, in lbs.		4·	4·1	3·5	4·3	4·1	4·1
Whim-engines.	Number reported		18	18	18	18	19	19
	Number of kibbles drawn		62,608	66,163	65,645	68.895	71,135	74.705
	Average depth of drawing, in fathoms		130·4	135·6	131·5	129·2	131·7	130·3
	Average number of horse whim-kibbles, of 3 cwts. drawn the average depth, by consuming 1 cwt. of coals		49·	49·7	47·8	51·7	51·6	66·6
	Average duty, as above		11·8	12·1	18·2	16·3	16·	16·5
Stamping-engines.	Number reported		6	6	6	6	6	6
	Average number of strokes per minute		13·9	14·	14·8	14·9	14·1	13·8
	Average duty as above		30·6	30·3	28·6	30·0	32·3	31·9
	Horse-power employed		88·5	90·1	54·9	58·2	104·9	111·1
Pumping-engines doing highest duty.	Great Polgooth	90-inch single	90·5	90·3	86·2	93·8	90·7	86·
	Par Consols	72 and 36-inch Sims' combined	89·9	94·1	88·3	92·	94·5	—
	Fowey Consols	80 inch single	87·8	93·	102·8	100·5	96·4	92·1
	Par Consols	80-inch single	84·2	44·1	87·5	98·3	90·	89·6
	Callington Mines	50-inch single	82·1	78·1	70·4	62·5	67·	72·
	Trelawny	50-inch single	77·4	70·3	—	73·9	67·	74·7
Whim-engines ditto.	Par Consols	24 and 13-inch Sims' combined	31·0	29·3	28·5	38·8	27·	27·1
	Fowey Consols	22-inch double	25·1	26·2	25·2	21·9	24·7	24·6
	Fowey Consols	22-inch double	20·3	19·5	18·3	20·8	24·2	23·9
	Callington Mines	22-inch double	17·2	18·9	16·3	—	—	—
	Par Consols	24-inch single	16·0	16·3	—	—	—	15·4
	Fowey Consols	18-inch double	15·4	—	—	—	—	—
Stamping-engines ditto.	Tamar Mines	30-inch single	43·3	44·4	41·4	45·8	44·1	39·2
	Great Polgooth	26-inch double	33·4	40·8	24·8	29·4	—	—
	South Caradon	26-inch single	30·3	—	32·0	30·3	31·7	35·5
	Tincroft	36-inch double	29·8	35·	—	—	38·5	44·0

The following ENGINES have exceeded the AVERAGE DUTY during the Twelve Months ending December, 1848.

	Mines.	Engines.	Length of stroke.	Load in pounds.	Load per sq. inch on plat.	Strokes per min.	Consump. of coal in bushels.	Million lbs lifted 1 ft. by con. of 1 bush. coal.	Av. quan. of water per min.
JANUARY.	Wh. Prosper..	Western 80-in.	9·7	95,826	15·0	6·7	3,766	54·0	1,466
	Ditto	Robert's 70-in.	9·75	66,366	13·2	7·2	2,332	64·1	
	Carn Brea	— 76-in. ..	9·0	81,548	13·9	5·0	2,131	58·6	590
	Ditto ..	Sims'50-90 com	9·0	57,392	22·8	6·1	1,834	57·8	
	United Mines	Taylor's 85-in.	11·0	97,108	15·9	6·2	2,854	86·0	—
	Ditto ..	Cardoza's90-in.	9·0	99,468	13·7	7·4	4,001	59·0	—
	Ditto ..	Eldon's 30-in.	9·0	13,631	16·0	8·6	507	70·3	—
	Ditto ..	Loam's 85-in.	10·0	89,320	11·8	7·5	3,676	55·3	—
	Perran St. Geo.	60&100-in. com	9·0	89,833	28·2	7·7	3,538	63·9	1,335
	East Wh. Rose	Penrose's70-in.	10·0	54,767	12·8	3·9	1,144	66·8	—
	Ditto ..	Michell's70-in.	10·0	62,087	14·5	5·1	1,719	67·6	1,043
FEBRUARY.	Wh. Prosper..	Robert's 70-in.	9·75	66,366	13·2	8·2	2,880	57·5	980
	United Mines	Taylor's 85-in.	11·0	97,108	15·5	6·1	2,970	81·7	
	Ditto ..	Cardoza's90-in.	9·0	99,468	13·7	7·9	4,312	58·2	1,661
	Ditto ..	Eldon's 30-in.	9·0	13,631	16·0	8·0	478	69·2	
	Ditto ..	Hocking'sS8-in	10·0	99,093	14·6	7·2	4,103	58·2	
	Perran St. Geo.	60&100-in. com	9·0	89,833	28·2	7·8	3,820	62·2	1,372
	East Wh. Rose	Michell's70-in.	10·0	62,087	14·5	4·9	1,584	70·2	688
	Ditto ..	Penrose's70-in.	10·0	54,767	12·8	4·1	1,234	67·1	
MARCH.	Great Work ..	Leed's 60-in...	9·0	47,020	12·9	10·5	2,997	58·2	249
	East W. Crofty	Trevenson's 80	10·33	85,026	12·6	4·9	2,863	57·1	277
	Carn Brea ..	— 76-in. ..	9·0	81,548	13·9	5·6	2,411	67·9	668
	Ditto	Sims' 50 & 90 inch comb.	9·0	57,392	22·8	7·0	2,118	66·5	
	United Mines	Taylor's 85-in.	11·0	97,108	15·5	7·4	4,418	82·8	
	Ditto ..	Cardoza's90-in.	9·0	99,468	13·7	8·4	5,974	56·2	
	Ditto ..	Eldon's 30-in.	9·0	13,631	16·0	8·2	899	70·8	2,295
	Ditto ..	Loam's 85-in.	10·0	89,320	11·8	9·7	6,166	54·0	
	Ditto ..	Hocking'sS8-in	10·0	99,093	14·6	8·8	6,496	57·3	
	Per. St. Geo.	Sims'60&100 inch comb.	9·0	90,279	28·2	8·7	5,080	61·2	1,531
	East Wh. Rose	Penrose's70-in.	10·0	56,966	13·3	4·2	1,734	63·5	698
	Ditto ..	Michell's70-in.	10·0	62,087	14·5	5·3	2,100	71·5	
	Wh. Mary Con.	— 63-in. ..	8·66	29,057	9·3	6·6	1,526	54·9	279
APRIL.	Great Work ..	Leed's 60-in...	9·0	47,020	12·9	10·0	2,349	57·1	238
	East W. Crofty	Trevenson's 80	10·33	85,273	12·6	4·6	2,060	59·4	260
	Carn Brea ..	— 76-in. ..	9·0	81,548	13·9	4·8	1,980	57·0	
	Ditto	Sims' 50 & 90 inch comb.	9·0	57,392	22·8	5·7	1,677	55·9	559
	Andrew and Nangiles	— 70-in. ..	10·0	50,527	10·4	4·7	1,440	53·8	286
	United Mines	Taylor's 85-in.	11·0	97,108	15·5	6·6	2,966	87·7	
	Ditto ..	Cardoza's90-in.	9·0	99,468	13·7	8·4	4,730	56·7	
	Ditto ..	Eldon's 30-in.	9·0	13,631	16·0	8·0	486	68·5	2,197
	Ditto ..	Loam's 85-in.	10·0	89,320	11·8	9·4	4,730	54·2	
	Ditto ..	Hocking'sS5-in	10·0	99,093	14·6	8·4	4,896	57·9	
	Per. St. Geo.	Sims' 60&100 inch comb.	9·0	90,279	28·2	8·0	3,771	62·4	1,466
	East Wh. Rose	Penrose's70-in.	10·0	57,610	13·4	4·3	1,358	67·1	677
	Ditto ..	Michell's70-in.	10·0	62,087	14·5	4·9	1,644	68·3	
	Wh. Mary Con.	— 63-in. ..	8·66	29,057	9·3	6·3	1,170	54·8	266

	Mines.	Engines.	Length of stroke.	Load in pounds.	Load per sq. inch on piat.	Strokes per min.	Consump. of coal in bushels.	Million lbs lifted 1 ft. by con. of 1 bush. coal.	Av. quan. of water per min.
MAY.	W. Wh. Treas.	Michell's 40-in.	9·0	24,185	17·0	9·6	1,512	59·0	476
	Great Work ..	Leed's 60-in...	9·0	47,020	13·9	9·6	2,088	61·3	228
	East W. Crofty	Trevenson's 80	10·33	85,520	12·7	4·3	1,876	62·8	243
	Carn Brea ..	— 76-in. ..	9·0	81,548	13·9	4·4	1,875	55·1	539
	Ditto	Sims' 90 & 50 inch comb.	9·0	57,392	22·8	5·8	1,558	61·3	
	Poldice ..	Sims' 85-in. ..	10·0	75,563	9·3	9·7	3,808	54·4	688
	Andw. & Nang.	— 70-in. ..	10·0	51,093	10·4	4·2	1.230	56·4	256
	United Mines	Taylor's 85-in.	11·0	97,108	15·5	6·3	2,922	86·0	2,009
	Ditto ..	Cardoza's 90-in.	9·0	99,468	13·7	7·5	4,266	55·7	
	Ditto ..	Eldon's 30-in.	9·0	13.631	16·0	8·5	510	69·1	
	Ditto ..	Loam's 85-in.	10·0	89,320	11·8	8·6	4,282	54·9	
	Ditto ..	Hocking's 85-in	10·0	99,113	14·6	7·6	4,398	58·5	
	Per. St. Geo.	Sims' 60 & 100 inch comb.	9·0	90,279	28·2	7·7	3,657	61·6	1,355
	East Wh. Rose	Penrose's 70-in.	10·0	57,931	13·5	4·4	1,358	69·1	659
	Ditto ..	Michell's 70-in.	10·0	62,393	14·5	4·6	1,578	66·9	253
	Wh. Mary Con.	— 63-in. ..	—	30,234	9·6	6·0	1,168	55·1	
JUNE.	Great Work ..	Leed's 60-in...	9·0	47,020	12·9	9·2	2 668	57·2	218
	East W. Crofty	Trevenson's 80	10·3	85,520	12·7	3·8	2,008	65·0	215
	Carn Brea	Sims' 50 & 90 inch comb.	9·0	57,392	22·8	5·0	1,722	58·7	250
	Andw. & Nang.	— 70-in. ..	10·0	51,492	10·7	3·4	1,234	58.7	207
	United Mines	Taylor's 85-in.	11·0	97,108	15·5	6·0	3,505	85·3	1,832
	Ditto ..	Cardoza's 90-in.	9·0	99,468	13·7	6·6	4,532	57·8	
	Ditto ..	Eldon's 30-in.	9·0	13.631	16·0	8·1	626	66·7	
	Ditto ..	Loam's 85-in.	10·0	89,320	11·8	7·7	4,768	54·9	
	Ditto ..	Hocking's 85-in	10·0	99,093	14·6	7·1	5,134	58·2	
	Per. St. Geo.	Sims' 60 & 100 inch comb.	9·0	90,279	28·2	7·2	4,194	63·3	1,267
	East Wh. Rose	Penrose's 70-in.	10·0	58.288	13·6	4·3	1,746	65·7	586
	Ditto ..	Michell's 70-in.	10·0	62,699	14·6	3·8	1,766	62·9	
	Wh. Mary Con.	— 63-in. ..	8·66	27,508	8·8	5·6	1,280	56·1	236
JULY.	Great Work ..	Leeds' 60-in...	9·0	47,020	12·9	8·8	2,088	56·1	209
	East W. Crofty	Trevenson's 80	10·33	85,767	12·7	3·5	1,366	68·1	198
	East Pool ..	— 60-in. ..	9·75	38,543	11·1	4·3	960	57·1	192
	Carn Brea	Sims' 50 & 90 inch comb.	9·0	60,336	23·8	4·3	1,311	67·0	383
	United Mines	Taylor's 85-in.	11·0	97,108	15·5	5·8	2,730	84·6	1,673
	Ditto ..	Cardoza's 90-in.	9·0	99,468	13·7	6·2	3,408	58·4	
	Ditto ..	Eldon's 30-in.	9·0	13.631	16·2	8·2	495	68·7	
	Ditto ..	Loam's 85-in.	10·0	89,320	11·8	6·8	3,300	56·0	
	Ditto ..	Hocking's 85-in	10·0	99.093	14·6	6·2	3.512	59·5	
	Tywarnhayle ..	Gardiner's 80 in	10·0	68.517	10·9	9·0	3,696	54·2	666
	Perran St. Geo.	Sims' 60 & 100c.	9·0	90.279	28·2	7·0	3,455	59·1	1,232
	East Wh. Rose	Penrose's 70-in.	10·0	58,609	13·6	4·0	1,376	62·1	561
	Ditto ..	Michell's 70-in.	10·0	62,699	14·6	3·6	1,254	66·5	
	Wh. Mary Con.	— 63-in. ..	8·66	27,508	8·8	6·0	1,025	56·7	253
AUGUST.	Great Work ..	Leeds' 60-in...	9·0	47,020	12·9	8·3	1,914	57·9	197
	East W. Crofty	Trevenson's 80	10·33	80,938	12·0	3·1	1,430	56·9	175
	East Pool ..	— 60-in. ..	9·75	38 534	11·1	3·8	912	53·4	169
	Andw. & Nang.	— 70-in. ..	10·0	51,492	10·7	3·4	1.020	56·1	207
	United Mines	Taylor's 85-in.	11·0	97,108	15·5	5·5	2,590	83·2	1,617
	Ditto ..	Cardoza's 90-in.	9·0	99,468	13·7	6·3	3,564	56·5	
	Ditto ..	Eldon's 30-in.	9·0	13,631	16·0	8·1	500	67·6	
	Ditto ..	Loam's 85-in.	10·0	89,320	11·8	6·3	3,198	54·2	
	Ditto ..	Hocking's 85-in	10·0	99,093	14·6	6·1	3,512	58·8	
	Tyrwarnhayle	Gardiner's 80in	10·0	68,517	10·9	8·5	3.408	55·4	629
	East Wh. Rose	Penrose's 70-in.	10·0	58,609	13·6	3·7	1,140	70·7	553
	Ditto ..	Michell's 70-in.	10·0	62 699	14·6	3·6	1,298	64·7	
	Wh. Mary Con.	— 63-in. ..	8·66	25,998	8·3	6·4	1,056	57·3	270

	Mines.	Engines.	Length of stroke.	Load in pounds.	Load per sq. inch. on piat.	Strokes per min.	Consump. of coal in bushels.	Million lbs lifted 1 ft. by con. of 1 bush. coal.	Av. quan. of water per min.
SEPTEMBER.	Great Work ..	Leeds' 60-in...	9·0	47,020	12·9	8·2	2,350	57·7	195
	East W. Crofty	Trevenson's 80	10·33	80 938	12·0	3·5	1,822	62·3	198
	East Pool ..	— 60-in. ..	9·75	38,534	11·1	3·7	1,080	54·5	165
	Poldice ..	Sims' 85-in. ..	10·0	82,138	10·1	6·3	3,456	53·0	447
	Andrew and Nangiles	— 70-in. ..	10·0	51,492	10·7	3·5	1,344	54·2	213
	United Mines	Cardoza's90-in.	9·0	99 468	13·7	5·6	3 868	58·2	
	Ditto ..	Eldon's 30-in.	9·0	13 631	16·0	8·0	600	68·7	1,586
	Ditto ..	Loam's 85-in.	10·0	89.320	11·8	6·3	3,879	55·2	
	Ditto ..	Hocking's85-in	10·0	99.093	14·6	7·7	5,313	59·5	
	Tywarnhayle..	Gardiner's80in.	10·0	68,517	10·9	8·1	4 014	54·8	599
	East Wh. Rose	Penrose's70-in.	10·0	58 609	13·6	3·7	1,364	71·4	552
	Ditto ..	Michell's70-in.	10·0	62,699	14·6	3·7	1,440	72·4	
OCTOBER.	Great Work ..	Leeds' 60-in...	9·0	47,020	12·9	8·0	1.779	59·9	190
	East W. Crofty	Trevenson's 80	10·33	80,938	12·0	4·1	1,668	63·1	231
	United Mines	Cardoza's90-in.	9·0	99,468	13·7	5·4	3,000	57·2	
	Ditto ..	Eldon's 30-in.	9·0	13 631	16·0	8·8	520	69·9	1,554
	Ditto ..	Loam's 85-in.	10·0	89 320	11·8	5·8	2.893	54·3	
	Ditto ..	Hocking's85-in	10·0	99,039	14·6	6·5	3,872	57·2	
	Tywarnhayle..	Gardiner's 80in	10·0	68.517	10·9	7·9	3,264	54·0	523
	East Wh. Rose	Penrose's70-in.	10·0	58,930	13·7	3·8	1,140	7·	552
	Ditto ..	Michell's70-in.	10·0	63,005	14·7	3·4	1,262	62·5	
	Wh. Mary ..	63-in.dir.acting	8·66	25,998	8·3	6·1	1,054	53·1	258
NOVEMBER.	Great Work ..	Leeds' 60-in...	9·0	47,020	12·9	8·2	2,475	55·7	66
	East W. Crofty	Trevenson's 80	10·33	80,938	12·0	4·4	2,320	60·8	72
	East Pool ..	— 60-in. ..	9·75	37,481	10·8	3·8	1,152	50·9	61
	Poldice ..	— 85-in. ..	10·0	75,563	9·3	6·6	3,560	53·1	63
	South Frances	— 75-in. ..	11·0	33,167	6·1	4·8	1,410	51·6	61
	United Mines	Cardoza's90-in.	9·0	99.468	13·7	6·2	4,106	59·8	71
	Ditto ..	Eldon's 30-in.	9·0	13,631	16·0	7·5	613	63·3	76
	Ditto ..	Loam's 85-in.	10·0	89.320	11·8	6·6	3,960	56·6	67
	Ditto ..	Hocking's85-in	10·0	99,093	14·6	6·6	4,502	61·7	73
	Treleigh Con.	Garden's 60-in.	10·25	37,179	10·5	5·8	1.608	50·5	60
	Tywarnhayle..	Gardiner's 80in	10·0	68,517	10·9	6·6	3,600	59·8	60
	East Wh. Rose	Penrose's70-in.	10·0	59.177	13·8	4·0	1,542	72·2	86
	Ditto ..	Michell's70-in.	10·0	63.688	14·8	3·2	1.384	69·9	83
	Wh. Mary ..	63-in.dir.acting	8·66	26,608	8·3	6·7	1,567	50·8	60
DECEMBER.	Great Work ..	Leeds' 60-in...	9·0	47,020	11·5	7·9	1,972	52·4	62
	East W. Crofty	Trevenson's 80	10·33	80 938	12·0	5·7	2,432	59·8	71
	East Pool ..	— 60-in. ..	9·75	37,481	10·8	4·8	1.152	50·7	60
	Carn Brea ..	— 76-in. ..	9·0	83,166	14·2	4·3	1,859	54·8	65
	Poldice- ..	— 85-in. ..	10·0	75,563	9·3	7·8	3,128	53·6	63
	South Frances	— 75-in. ..	11·0	32,770	6·1	6·0	1,296	54·9	65
	United Mines	Cardoza's90-in.	9·0	99,468	13·7	7·2	3,820	59·7	71
	Ditto ..	Eldon's 30-in.	9·0	13,631	16·0	6·9	486	59·0	70
	Ditto ..	Loam's 85-in.	10·0	89,320	11·8	7·2	3,548	53·2	63
	Ditto ..	Hocking's85-in	10·0	99.093	14·6	7·2	4,194	58·3	69
	Tywarnhayle..	Gardiner's 80in	10·0	69,527	11·0	6·9	2,808	55·6	66
	East Wh. Rose	Penrose's70-in.	10·0	59.498	13·9	4·1	1,269	70·0	83
	Ditto ..	Michell's70-in.	10·0	64,025	14·9	3·6	1,116	75·3	90
	Ditto ..	Purser's 56-in.	10·33	38,479	12·2	2·7	656	52·2	62

SHARE LIST of BRITISH and FOREIGN MINES.

Shares.	Company.	Paid.	Total Cost.	Price.	Market Value.
			£ s.		£
1,000	Abergwessin	8	8,000 0	8	8,000 0
512	Albert Consols	1	512 0	2½	1,280 0
1,024	Alfred Consols	8⅜	8,576 0	5	5,120 0
1,000	Antimony and Silver-Lead	5	5,000 0	5½	5,500 0
1,024	Ashburton United Mines	8⅜	8,576 0	10	10,240 0
1,624	Balleswidden	9	15,616 0	18	21,232 0
128	Balnoon Consols	25	3,200 0	25	3,200 0
10,000	Banwen Iron Company	6	60,000 0	6½	65,000 0
1,000	Barristown	5½	5,750 0	1½	1,500 0
4,000	Bedford	2	8,000 0	2¾	11,000 0
1,244	Birch Tor Tin Mine	9	11,196 0	—	—
8,000	Blaenavon	50	400,000 0	17½	140 000 0
100	Botallack	182	18,200 0	60	6,000 0
120	Brewer	5	600 0	7	840 0
10,000	British Iron, New, regis. ..	12	120,000 0	7	70,000 0
—	Ditto ditto, scrip. ..	10	—	10	—
128	Budnick Consols	52½	6,720 0	35	4 480 0
1,000	Callington	19	19 000 0	14	14.000 0
1.000	Camborne Consols	5	5,000 0	4	4 000 0
20,000	Cameron's Steam Coal	6	120,000 0	1	20,000 0
256	Caradon Copper Mine	9½	2,432 0	3	768 0
256	Caradon Mines	22½	5,800 0	10	2,560 0
256	Caradon United	24	6,144 0	5	1,280 0
256	Caradon Wheal Hooper	21	768 0	8	2,048 0
1,000	Carn Brea	15	15,000 0	100	100,000 0
3,000	Carthew Consols	1½	45,000 0	5	15,000 0
112	Charlestown	220	24,640 0	60	6,720 0
512	Coatlithe Hill	½	256 0	1	512 0
500	Comblawn	5⅜	2,875 0	3	1,500 0
128	Comfort	45	5,760 0	35	4,480 0
256	Condurrow	20	5,120 0	36	9,116 0
2.560	Cook's Kitchen	14	35,840 0	2	5.120 0
1,000	Coombe Valley Quarry	3½	3,500 0	4½	4,500 0
6,500	Cornish Mining Company ..	2	13,000 0	2⅝–½	16,250 0
20,000	Cornwall New Mining	1	20.000 0	1	20,000 0
1,000	Copper Bottom	1½	1,500 0	6½	6,500 0
1,024	Coskeen	4⅛	4,224 0	20	20,480 0
212	Craddock Moor	23⅛	4,929 0	5	1,060 0
128	Creeg Braws	120	15,360 0	100	12,800 0
500	Cubert Mine	12½	6,250 0	—	—
1,000	Cwm Erfin	3	3.000 0	4	4,000 0
300	D. Prior and Buckfastleigh	16	4,800 0	16	4,800 0
7,100	Derwent	8½	60,350 0	5	35,500 0
815	Devon and Courtenay Consols ..	7⅞	6,548 15	⅞	635 15
1.024	Devon Great Consols	1	1,024 0	230	135,520 0
1,000	Dhurode	2	2,000 0	5	5,000 0
186	Dolcoath	30	5,580 0	15	2 790 0
2.560	Drake Walls	5	12,800 0	4	12,240 0
10.000	Durham County Coal	45	450.000 0	9	90,000 0
3,000	Dyfngwm	10	30,000 0	12½	37,500 0
512	East Alvenney	5½	2.816 0	12½	6,400 0
2,500	East Birch Tor	3	7,500 0	3½	8,750 0
112	East Caradon	47	5,264 0	47	5,264 0
2,048	East Crowndale	6½	13,056 0	2½	5,120 0
512	East Combe Silver-Lead	5½	2,328 0	6½	3,328 0
	Carried forward ..		1,650,410 15		1,179,165 15

Shares.	Company.	Paid.	Total Cost.	Price.	Market Value.
			£ s.		£ s.
	Brought forward ..		1,650,410 15		1,179,165 15
128	East Pool	15	1,920 0	30	3 840 0
9,000	East Tamar Consols ..	¾	6,750 0	¾	6,750 0
—	East Wheal Albert	1	—	3	—
94	East Wheal Crofty	125	11,750 0	250	23,500 0
1,024	East Wheal Fortune	2	2,048 0	3	3,072 0
128	East Wheal Rose	50	6,400 0	600	76,800 0
—	East of Scotland Iron Company	5	—	1⅛	—
123	East Wheal Seton..	14	1,722 0	10	1,230 0
1,280	Esgair Lli	1½	1,920 0	5	6,400 0
256	Exmoor Wheal Eliza	6	1,536 0	9–10	2,560 0
512	Fowey Consols	40	20,480 0	45	23,040 0
1,024	Frydd Llwydd Mines	1¼	1,280 0	3½	3,584 0
6,400	Gadair	2	2,800 0	2	12,800 0
4,000	General Mining Comp. for Ireland	1⅛	5,500 0	1½	6,000 0
256	Gonamena	44½	11,392 0	16	4,096 0
128	Goonvrea	4	502 0	2	256 0
100	Great Consols	1,000	100,000 0	250	25,000 0
1,900	Great Michell Consols	1¼	2,375 0	½	950 0
256	Great Resugga Moor	11	2,816 0	6	1,536 0
512	Great Wheal Rough Tor Consols	18½	9,472 0	11	5,632 0
1,200	Grown Slate Company	5	6,000 0	5	6,000 0
256	Gwinear Consols	7	1 792 0	1	256 0
6,000	Heigneston Down Consols ..	⅓	3,000 0	1	6,000 0
256	Herodsfoot	27	6,912 0	24	6,144 0
10,000	Hibernian	12½	122,400 0	1⅜	13,750 0
239	Hobb's Hill	6	1,434 0	1½	358 0
1,000	Holmbush	22	22,000 0	1½	1,500 0
1,024	Kingsett and Bedford	½	512 0	¾	778 0
827	Kirkcudbrightshire	8½	7,019 10	2	1,654 0
2,048	Lamheroos Wheal Maria ..	13	26,624 0	2	4,096 0
252	Lanarth Consols	—	—	10	2,520 0
128	Lelant Consols	90	11,520 0	60	7,680 0
160	Levant	—	—	120	19 200 0
1,000	Lewis	16	16,000 0	8	8,000 0
1,000	Llwyn Malees	7½	7,500 0	7	7,000 0
3,600	Llynvi Iron	50	180,000 0	50	180,000 0
256	Lostwithiel Consols	19	5,264 0	14	3 584 0
6,000	Marke Valley	10	60,000 0	1½	9,000 0
5,000	Mendip Hills	3	15,000 0	1½–¼	7,500 0
5,000	Merionethshire Slate Company ..	1½	7,500 0	2	10,000 0
128	Metha	34	4,352 0	140	17,920 0
20,000	Mining Company of Ireland ..	7	140,000 0	4	80,000 0
256	New East Crowndale	3¾	960 0	2½	740 0
128	North Fowey Consols	37	4,836 0	10	1.280 0
100	North Pool	45	4,500 0	500	16,500 0
140	North Roskear	5½	735 0	165	23,100 0
262	North Wheal Leisure	1½	393 0	2	524 0
15,000	Northern Coal Company	23	345,000 0	2	30,000 0
128	Par Consols..	55⅛	7,088 0	1,000	128,000 0
8,000	Pennant and Craigwen	2	16,000 0	2	16,000 0
100	Penrhiw	30	3,000 0	65	6,500 0
1,024	Penzance Consols	16s.3d.	832 0	2	2,048 0
512	Plymouth Wheal Yeoland ..	6½	3,136 0	10	5,120 0
200	Polsaith Consols	5½	1,100 0	4½	850 0
2,500	Rhoswiddol and Bacheidon ..	10	25,000 0	10	25,000 0
10,000	Rhymney Iron	50	500,000 0	13	130,000 0
10,000	Ditto New	7	70,000 0	6¾	68,750 0
1,000	Rosewall Hill	1	1,000 0	5	5,000 0
	Carried forward ..		3,519.482 5		2,227,663 1

Shares.	Company.	Paid.	Total Cost.	Price.	Market Value.
			£ s.		£ s.
	Brought forward ..		3,519,482 5		2,227,663 15
256	Rosewarva Mines	—	— 0		3,072 0
2,048	Runnaford Coombe Tin	¾	1,536 0		14,336 0
128	South Caradon	5	640 0	400	51,200 0
1,100	South Dolcoath	4	4,400 0	5	5,500 0
256	South Friendship Wheal Ann ..	20	5,120 0	4	1,024 0
256	South Molton	5	1,280 0	12½	3,200 0
256	South Tolgus	10	2,560 0	55	14,080 0
256	South Trelawny	28½	7,296 0	3	768 0
2,000	South Wales Mining Company ..	¾	1,500 0	1–1½	3,000 0
128	South Wheal Basset	110	14,080 0	150	19,200 0
124	South Wheal Frances	160	19,840 0	240	29,760 0
256	South Wheal Josiah	—	—	1½–2	512 0
1,000	South Wheal Maria	2¾	2,750 0	1½	1,500 0
40,000	Southern and Western, Irish ..	2	20,000 0	4	40,000 0
280	Spearne Moor	30	8,400 0	40	11,200 0
256	St. Austell Consols	9	2,304 0	—	—
94	St. Ives Consols	—	—	320	30,080 0
128	St. Michael Penkivel	5	640 0	10½	1,344 0
999	St. Minver Consols	1	999 0	6	5,994 0
1,000	Stray Park	43	43,000 0	20	20,000 0
9,600	Tamar Consols	3	28,800 0	6¼	60,000 0
1,024	Tavy Consols	4	4,096 0	4	4,096 0
6,000	Tincroft	7	42,000 0	6½	39,000 0
1,000	Tin Vale	2¾	2,750 0	3½	3,500 0
58	Tokenbury	170	9,860 0	10	580 0
256	Tollpetherwin	3½	896 0	5	1,280 0
256	Tregordan	2	512 0	8	2,048 0
256	Trehane	1¼	320 0	30	7,680 0
5,000	Treleigh Consols	6	30,000 0	1½	7,500 0
2,000	Trenance	3	6,000 0	—	—
96	Treavean	10	960 0	150	14,400 0
120	Trethellan	5	600 0	16	1,920 0
120	Treviskey and Barrier	130	15,600 0	87	10,440 0
288	Trevean	1½	324 0	5	1,440 0
100	United Mines	300	30,000 0	350	35,000 0
256	Wellington Mines	26	6,400 0	20	5,120 0
256	West Caradon	20	5,120 0	130	33,480 0
512	West Fowey Consols	40	20,480 0	12	6,144 0
256	West Providence	9	2,304 0	15	3,840 0
200	West Seton	40	8,000 0	210	42,000 0
—	West of Scotland Iron Company	240	—	90	—
120	West Trethellan	5	600 0	30	3,600 0
256	West United Hills	—	—	4½	1,088 0
512	West Wheal Frances	1⅝	780 0	2	1,024 0
256	West Wheal Friendship	9	2,304 0	8	2,048 0
3,725	West Wheal Jewel	11	40,975 0	1½	4,656 0
256	West Wheal Tolgus	21½	5,440 0	6	1,536 0
256	West Wheal Treasury	19	4,864 0	10	2,560 0
1,024	Whiddon Mines	4⅜	4,864 0	3	3,072 0
5,200	Wicklow Copper	5	26,000 0	8	41,600 0
107	Wheal Adams	79	8,453 0	30	3,210 0
1,000	Wheal Agar	—	—	8	8,000 0
256	Wheal Albert	10	2,560 0	1	256 0
240	Wheal Anderton	23	5,520 0	15	3,600 0
128	Wheal Ann	—	—	50⅞	6,516 0
512	Wheal Anna Maria	6½	3,328 0	8	4,096 0
1,024	Wheal Ash	4½	4,608 0	8	8,192 0
120	Wheal Bal	5½	660 0	20	2,400 0
	Carried forward ..		3,981,575 5		2,859,585 15

Shares.	Company.	Paid.	Total Cost.	Price.	Market Value.
			£ s.		£ s.
	Brought forward ..		3,981,575 5		2,858,585 15
256	Wheal Benny	14½	3,712 0	2	512 0
256	Wheal Blencowe	21	5,376 0	5	1,280 0
256	Wheal Bucketts	20	5,120 0	5	5,120 0
256	Wheal Calstock	5	1,280 0	12	1,280 0
1,024	Wheal Coad	1	1,024 0	4	4,096 0
268	Wheal Courtenay	12½	3,350 0	15	4,020 0
256	Wheal Fortescue	6½	1,664 0	3	768 0
388	Wheal Franco	27	9,126 0	18	6,984 0
128	Wheal Harriet	45	5,760 0	—	—
100	Wheal Henry	—	—	31½	3,150 0
1,024	Wheal Lawrence	3	3,072 0	3	3,072 0
112	Wheal Margaret	79	8,848 0	250	28,000 0
512	Wheal Mary Ann	5	2,560 0	14	7,168 0
208	Wheal Mary Consols	60½	12,549 0	8	1,664 0
—	Wheal Penhale	—	—	12	—
210	Wheal Prospect	4	840 0	7	1,470 0
120	Wheal Reeth	41	4,920 0	150	18,000 0
128	Wheal Rose	60	7,680 0	5	640 0
99	Wheal Seton	214	22,286 0	720	61,280 0
180	Wheal Sisters	35⅝	6,435 0	5	900 0
512	Wheal Sophia	3⅜	1,718 0	5	2,560 0
128	Wheal Spearne	10	1,280 0	75	9,700 0
128	Wheal St. Ann	30	3,840 0	35	4,480 0
550	Wheal Trescoll	5	2,750 0	6½	2,575 0
260	Wheal Trelawny	7¾	2,015 0	72	18,720 0
256	Wheal Tremaine (St. Ervan) ..	9½	2,432 0	2½	554 0
1,024	Wheal Tremayne	9⅜	9,600 0	3	3,072 0
92	Wheal Tryphena	140	12,880 0	265	24,380 0
1,000	Wheal Vincent	1⅜	1,375 0	6	6,000 0
256	Wheal Vlow (Perranz)	⅜	96 0	⅜	96 0
184	Wheal Vyvyan	—	—	60	11,040 0
250	Wheal Williams	28⅜	7,093 15	8	2,000 0
1,024	William and Mary Worth ..	2	2,048 0	2½	2,562 0
	Total		4,133,304 0		3,095,728 15
	FOREIGN MINES.				
5,000	Alten Mining Company	14½	62,500 0	1½	7,500 0
15,000	Asturian Mining Company ..	13	195,000 0	3⅜–7	58,135 0
20,000	Australian	3	60,000 0	5⅜–6½	130,000 0
10,000	Anglo-Mexican Company ..	100	1,000,000 0	¼	2,500 0
12,374	Ditto Subscription	25	309,350 0	1¼	15,467 0
6,000	Barossa Range	1⅜	8,250 0	1½	9,000 0
3,000	Bolanos	150	450,000 0	3	9,000 0
2,000	Ditto Scrip	15	30,000 0	3¾	7,500 0
10,000	Brasilian Imperial..	23	230,000 0	7	70,000 0
12,000	Cobre Copper Company	40	480,000 0	13	156,000 0
10,000	Copiapo Mining Company ..	14	140,000 0	3	30,000 0
10,000	General Mining Association ..	20	200,000 0	10	100,000 0
—	Guadalcanal	3½	—	5½	—
5,000	Kinzigthal Mining Association ..	2	10,000 0	3	15,000 0
20,051	Mexican Company..	59	1,183,009 0	1	20,051 0
2,000	Mexican and South American ..	8	16,000 0	½	1,000 0
5,000	National Brasilian..	30	150,000 0	3½	17,500 0
104,000	North British Australasian ..	1	104,000 0	¼	26,000 0
7,000	Royal Santiago	10	70,000 0	4	28,000 0
11,000	St. John del Rey	15	165,000 0	14¼	155,275 0
13,174	United Mexican .. .. av.	28¼	372,165 10	4¼–3⅜	55,976 0
	Total		5,235,274 10		913,904 0

A TABLE, *showing the equivalents of Dates of the Months both of the Old and New Style, arranged synoptically for the Nineteenth Century, by* JOHN MULLINS, ESQ.

The slight importance to be attached to a Table of this description, arising from its apparent simplicity, requires one or two prefatory remarks, to point out the utility and value of the data of which it is composed, the compilation being attended with no small degree of trouble and care.

The notes accompanying the table will best convey an idea of the practical utility and mode of application, while it may be well to observe by way of illustration, that the merchant of Russia, with whom we trade for hemp, tallow, and other produce used in our home mines, uniformly draws bills on this country at given periods, or a certain number of months after date of shipment, it being remembered that such bills are drawn with dates of the old style. To determine when such bills become due, observing the new style, it will be found that a table is essentially necessary to facilitate such mercantile operations; and, on the other hand, the Russians import metals and merchandise from this country; thence its importance in a twofold point of view. We believe the table to be original, and well calculated for the use of the merchant and miner.

Months of	days	OLD STYLE.																													
	31	Jan., Mar., May, July, Aug., Oct., Dec...	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
	30	April, June, September, November....	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	0	19	20	21	22	23	24	25	26	27	28	29	30
	29	February in Leap Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	0	0	18	19	20	21	22	23	24	25	26	27	28	29
	28	February in Common Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	0	0	0	17	18	19	20	21	22	23	24	25	26	27	28
		NEW STYLE	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	1	2	3	4	5	6	7	8	9	10	11	12

Application of the Table.—(The Russians and the Greeks still retain the old style.)—By the table it will at once be seen that the 1st of Jan., the 1st of March, &c. in Russia are respectively the 13th Jan., the 13th March, &c. in England, and that the 1st of Jan. in England is the 20th December (the month last past) in Russia; and that the 20th Jan. in Russia is the 1st Feb. (the month next following) in England. Again, the 17th Feb. (common year) in Russia is the 1st March in England; but observe that in leap year it is the 18th Feb. in Russia that is the 1st March in England. The 18th June in Russia is the 30th June in England, and the 19th June in Russia is the 1st July in England. Observe here that you pass on from the 18th over a division in the table, marked 0, to the 19th; again, in February (leap year) you pass on over two divisions, marked 0 0, from the 17th to the 18th; and further, in February (common year) you pass over three divisions, marked 0 0 0, from the 16th to the 17th. Thus, by taking the proper line, according to the number of days in the month, you instantly find immediately below the given date (Russian reckoning) in the bottom line the equivalent in English reckoning; and the reverse holds good.

Note.—The old style was used in England until Wednesday, Sept. 2, 1752, inclusive, when the following day, Thursday (instead of being regarded as the 3rd Sept.), was, by authority of Parliament, ordered to be reckoned as the 14th Sept., thus omitting eleven days; and it was further enacted, that *one* day should be dropped in every hundredth year, excepting the fourth hundredth. Thus, in the last century the 3rd Sept. 1752 was reckoned as the 14th, but in this century the 3rd Sept. is reckoned the 15th Sept.; thus by taking this last enactment into account, the chronologist can, by adjusting the bottom line accordingly, adopt the above table to other centuries.

PART V.

Directory.

PRESENT ROYAL FAMILY.

QUEEN VICTORIA, *b.* May 24, 1819; *suc.* June 20, 1837; *cr.* June 28, 1838; *m.* Feb. 10, 1840, to

FRANCIS ALBERT AUGUSTUS CHARLES EMANUEL, Duke of Saxe, Prince of Coburg and Gotha, *b.* August 26, 1819.

Issue.

VICTORIA ADELAIDE MARY LOUISA, Princess Royal, *b.* Nov. 21, 1840.

ALBERT EDWARD, Prince of Wales, *b.* Nov. 9, 1841.

ALICE MAUD MARY, *b.* April 15, 1843.

ALFRED ERNEST ALBERT, *b.* Aug. 6, 1844. HELENA AUGUSTA, *b.* May 25, 1846.

LOUISA CAROLINE ALBERTA, *b.* March 18, 1848.

King of Hanover	*born* June 5, 1771
Dowager Queen Adelaide	Aug. 13, 1792
Duke of Cambridge	Feb. 24, 1774
Duchess of Gloucester	April 25, 1776
Princess Sophia	Nov. 3, 1777
Princess Sophia Matilda	May 23, 1773
Duchess of Kent	Aug. 17, 1786
Duchess of Cambridge	Mar. 25, 1797
Crown Prince of Hanover	May 27, 1817
Prince George of Cambridge	Mar. 26, 1819
Princess Augusta of Cambridge	July 19, 1822
Princess Mary of Cambridge	Nov. 27, 1833

MEMBERS OF THE HOUSE OF PEERS.

PEERS OF THE BLOOD ROYAL.

Ernest Augustus, Duke of Cumberland and Teviotdale, K.G., G.C.B., G.C.H., King of Hanover.

Adolphus Frederick, Duke of Cambridge, K.G., G.C.B., G.C.H., Cambridge-ho., 94, Piccadilly, and Kew.

ARCHBISHOPS.

Canterbury.—John Bird Sumner, 1848. Lambeth-palace.

York—Thomas Musgrave, D.D., b.1788, consecrated Bishop of Hereford, 1837, translated to York 1847. 17, Hill-st.

DUKES.

1682 Beaufort, K.G., 23, Arlington-street.
1694 Bedford, K.G., 6, Belgrave square.
1822 Buckingham, K.G., 91, Pall Mall.
1833 Cleveland, K.G., 17, St. James's-sq.
1694 Devonshire, K.G., 78, Piccadilly.
1675 Grafton, 47, Clarges-street.
1694 Leeds (no town residence).
1719 Manchester (no town residence).
1702 Marlborough, 16, Eaton-square.
1756 Newcastle, K.G., 17, Portman-sq.
1483 Norfolk, 21, St. James's-square.
1766 Northumberland, Charing-cross.
1716 Portland, 19, Cavendish-square.
1675 Richmond, K.G., 51, Portland-pl.
1703 Rutland, K.G., 85, Pall Mall.
1683 St. Albans, 80, Piccadilly.
1546 Somerset, Park-lane.
1833 Sutherland, K.G., Stafford-house.
1814 Wellington, K.G., G.C.B. Apsley-ho.

MARQUISES.

1790 Abercorn, K.G., Park-lane.
1821 Ailesbury, K.T., 41, Grosvenor-sq.
1831 Ailsa, 57, St. James's-street.
1815 Anglesea, K.G., 1, Old Burling.-st.
1831 Breadalbane, K.T., 21, Park-lane.
1826 Bristol, 6, St. James's-square.
1796 Bute, 1, Regent-street.
1812 Camden, K.G., 9, Belgrave-square.
1815 Cholmondeley, 12, Carlton-house.
1801 Exeter, K.G., 36, Grosvenor-sq.
1793 Hertford, K.G., 13, Berkeley-sq.
1784 Lansdowne, K.G., 54, Berkeley-sq.
1838 Normanby, Reform-club.
1812 Northampton, 145, Piccadilly.
1789 Salisbury, K.G., 20, Arlington-st.
1786 Townsend (no address in London).
1837 Westminster, 33, Up. Grosvenor-st.
1551 Winchester (no town residence).

EARLS.

1784 Abergavenny, 58, Portland-place.
1682 Abingdon, Carlton-club.
1696 Albemarle, 12, Berkeley-square.
1826 Amherst, G.C.H., 66, Grosvenor-st.
1730 Ashburnham, 30, Up. Grosvenor-st
1839 Auckland.
1714 Aylesford (no town residence).
1772 Bathurst, 4, Wilton-crescent.
1815 Beauchamp, 37, Portman-square.
1790 Beverley, 8, Portman-square.
1815 Bradford, 43, Belgrave-square.
1815 Brownlow, 12, Belgrave-square.
1746 Buckinghamshire, 1, Spanish-pl.
1831 Burlington, 10, Belgrave-square.
1800 Cadogan, 138, Piccadilly.
1831 Camperdown (no town residence).
1661 Cardigan, 36, Portman-square.
1661 Carlisle, 12, Grosvenor-place.
1793 Carnarvon, 43, Grosvenor-square.
1814 Cathcart, K.C.B., Carlton-club.
1827 Cawdor, 74, South Audley-street.
1628 Chesterfield, Chesterfield-house.
1801 Chichester (no town residence).
1776 Clarendon, G.C.B., 1, Grosv.-cres.
1753 Cornwallis, 6, Hill-street.
1718 Cowper, 1, Great Stanhope-street.
1801 Craven, 16, Charles-street.
1711 Dartmouth, 23, St. James's-square.
1816 De Grey, K.G., 4, St. James's-sq.
1761 De la Warr, 17, Up. Grosvenor-st.
1622 Denbigh, 44, Eaton-square.
1485 Derby, 23, Grosvenor-square.
1553 Devon, 4, Bryanstone-square.
1790 Digby, 35, Brook-street.
1837 Ducie, 24, Belgrave-square.
1837 Effingham, 57, Eaton-place.
1821 Eldon, 1, Hamilton-place.
1844 Ellenborough, Grosvenor-crescent.
1846 Ellesmere, 18, Belgrave-square.
1661 Essex, 3, Chapel-street.
1821 Falmouth, Carlton-club.
1711 Ferrers (no town residence).
1841 Fitzhardinge, Spring-gardens.
1716 Fitzwilliam, Halkin-street.
1789 Fortescue, 17, Grosvenor-square.
1841 Gainsborough, 9, Cavendish-sq.
1833 Granville, 16, Bruton-street.
1802 Grey, 30, Berkeley-square.
1752 Guildford, Carlton-club.
1719 Harborough, Steven's-hotel.
1754 Hardwicke, Carlton-club.
1812 Harewood, 13, Hanover-square.
1742 Harrington, Whitehall-gardens.
1809 Harrowby, 39, Grosvenor-square.
1821 Howe, G.C.H., Curzon-house.
1529 Huntingdon, Union-club.
1756 Ilchester, 31, Old Burlington-st.
1697 Jersey, 38, Berkeley-square.
1837 Leicester (no address in London).
1831 Lichfield (no town address).
1626 Lindsey (no town address).
1796 Liverpool, G.C.B., Fife-house.
1807 Lonsdale, 14, Carlton-house-terr.

1838 Lovelace, 19, Gt. Cumberland-st.
1721 Macclesfield, 9, Conduit-street.
1800 Malmesbury, 8, Whitehall gardns.
1792 Mansfield, K. T., Carlton-club.
1806 Manvers, 13, Portman-sq.
1813 Minto, G.C.B., 48, Eaton-square.
1815 Morley, Kent-ho., Knightsbridge.
1789 Mt. Edgecombe (no town address).
1831 Munster, Regent's-park-barracks.
1805 Nelson, 19, Gloucester-place.
1801 Onslow, Clarendon-hotel.
1806 Orford, White's-club.
1711 Oxford, 4, John-street.
1551 Pembroke, 7, Carlton-house-terr.
1721 Pomfret, 100, Mount-street.
1743 Portsmouth (no address in London).
1706 Poulett, 9, Gt. Stanhope-street.
1804 Powis, 45, Berkeley-square.
1765 Radnor, 52, Grosvenor-street.
1833 Ripon, 1, Carlton-gardens.
1801 Romney, 7, Grosvenor-street.
1801 Rosslyn, 6, Grosvenor-place.
1815 St. Germans, 36, Dover-street.
1660 Sandwich, 9, Lowndes-square.
1690 Scarborough, 41, South-street.
1672 Shaftesbury, 24, Grosvenor-sq.
1442 Shrewsbury, Mivart's-hotel.
1821 Somers, 45, Grosvenor-place.
1765 Spencer, Spencer-house.
1628 Stamford, 33, Hill-st., Berkeley-sq.
1718 Stanhope, 29 B, Albemarle-street.
1821 Stradbroke, 18, Queen-street.
1847 Strafford, G.C.B., G.C.H., 44, Grosvenor-street.
1603 Suffolk, 9, Clarges-street.
1784 Talbot, K.P., 10, Gt. George-st.
1714 Tankerville, 35, Curzon-street.
1628 Thanet, 78, Gloucester-place.
1815 Verulam, 43, Grosvenor-sq.
1685 Waldegrave, 4, Harley-street.
1746 Warwick, K.T., 7, Carlton-gardns.
1624 Westmoreland, G.C.B., 12, Upper Harley-st.
1801 Wilton, 7, Grosvenor-square.
1628 Winchelsea, 20, Wilton-crescent.
1837 Yarborough, 17, Arlington-st.
1838 Zetland, 19, Arlington-street.

VISCOUNTS.

1823 Beresford, G.C.B., 16, Cavendish-sq.
1712 Bolingbroke (no town residence).
1828 Canning, 10, Grosvenor-sq.
1835 Canterbury, 4, Bolton-row.
1826 Combermere, G.C.B., G.C.H., 48, Belgrave-square.
1816 Exmouth, Carlton-club.
1846 Hardinge, G.C.B., 15, Stanhope-st.
1550 Hereford, 12, Portland-place.
1842 Hill, Carlton-club.
1766 Maynard, 38, Grosvenor-square.
1802 Melville, K.T., 3, Somerset-place.
1839 Ponsonby, G.C.H., 15, Stanhope-st.
1801 St. Vincent, 57, St. James's-st.
1805 Sidmouth, St. James's-hotel.
1789 Sydney, 3, Cleveland-square.
1721 Torrington.

BISHOPS.

		Cons.
Rt. Hn. Dr. C. J. Blomfield	London	1824
Dr. E. Maltby	Durham	1831
Dr. C. R. Sumner	Winchester	1826
Dr. J. Kaye	Lincoln	1820
Dr. C. Bethell	Bangor	1824
Hon. Dr. H. Percy	Carlisle	1827
Dr. G. Murray	Rochester	1813
Dr. E. Copleston	Llandaff	1827
Hon. Dr. R. Bagot	Bth. & Wells	1829
Dr. J. H. Monk	Glos. & Bris.	1830
Dr. H. Phillpotts	Exeter	1830
Dr. C. H. Longley	Ripon	1836
Dr. E. Denison	Salisbury	1837
Dr. E. Stanley	Norwich	1837
Dr. G. Davys	Peterboro.	1839
Dr. C. Thirlwall	St. David's	1840
Dr. H. Pepys	Worcester	1840
Dr. A. T. Gilbert	Chichester	1842
Dr. J. Lonsdale	Lichfield	1843
Dr. T. Turton	Ely	1845
Dr. S. Wilberforce	Oxford	1845
Dr. T. V. Short	St. Asaph	1841
Dr. J. P. Lee	Manchester	1847
Dr. Hampden	Hereford	1847
Dr. J. Graham	Chester	1848
Hon. R. J. Eden, D.D.	Sodor & Man	1847

BARONS.

1801 Abercromby (no town residence).
1835 Abinger, 4, New-street.
1801 Alvanley, 57, St. James's-street.
1605 Arundell, 3, Cork-street.
1835 Ashburton, 12, Great Stanhope-st.
1297 Audley (no town residence).
1780 Bagot, Carlton-club.
1837 Bateman, 10, Lower Grosvenor-st.
1797 Bayning, 15, Lower Berkeley-st.
1433 Beaumont, 18, Curzon-street.
1839 Beauvale, G.C.B., 12, Hyde-park-terrace.
1455 Berners (no town residence).
1784 Berwick, 1, Stable-yard.
1823 Bexley, 31, Great George-street.
1797 Bolton, Mivart's-hotel.
1761 Boston United Service-club.
1788 Braybrooke, 10, New Burlington-st.
1830 Brougham, 4, Grafton-street.
1643 Byron, 21, Eaton-place.
1796 Calthorpe, 33, Grosvenor-square.
1841 Campbell, South-place.
1344 Camoys, 12, Dyrset-square.
1834 Carew, 28, Belgrave-square.
1796 Carrington, Whitehall-yard.
1784 Carteret (no town residence).
1815 Churchill, 9, King-street.
1672 Clifford, Ford's-hotel, Man-square.
1299 Clinton, 18, Upper Grosvenor-st.
1789 Cloncurry (no town residence).
1839 Colborne, 19, Hill-street.
1817 Colchester, 76, South Audley-st.
1841 Congleton, 24, Coles-terrace.
1836 Cottenham, 15, Park-lane.
1828 Cowley, 12, Lower Grosvenor-st.
1806 Crewe, 2, Hill-street.

1307 Dacre, 2, Chesterfield-street.
1839 De Freyne, 45, Oxford-terrace.
1821 Delamere, 33, Upper Brook-street.
1835 De Lisle, 16, New Burlington-st.
1838 De Mauley, 21, St. James's-place.
1834 Denman, 38, Portland-place.
1264 De Ros, 11, Grafton-street.
1831 De Saumarez, University-club.
1826 De Tabley, Mivart's-hotel.
1831 Dinorben, 75, South Audley-street.
1786 Dorchester, Christie's-hotel.
1615 Dormer (no town address).
1790 Douglas, 6, St. George's-place.
1839 Dunfermline, 7, Lower Brook-st.
1780 Dynevor, 34, Dover-street.
1806 Erskine (abroad).
1826 Feversham, 25, Belgrave-square.
1776 Foley, 26, Grosvenor square.
1821 Forester, 21, Charles-street.
1800 Gardner, 46, Dover-street.
1824 Gifford, Putney-common.
1835 Glenelg, H., 4, Albany.
1832 Godolphin, Brooks's-club.
1846 Gough, G.C.B. (in India).
1782 Grantley, 10, Wilton-place.
1289 Hastings, 7, Cavendish-square.
1815 Harris, 30, Albemarle-street.
1835 Hatherton, Reform-club.
1776 Hawke, 97, Mount-street.
1828 Heytesbury, G.C.B., 78, Park-st.
1792 Holland, 95, Piccadilly.
1597 Howard de Walden.
1831 Howden (abroad).
1839 Keane, United Service-club.
1788 Kenyon, 9, Portman-square.
1836 Langdale, 37, South-street.
1839 Leigh, 30, Portman-square.
1797 Lilford, 10, Grosvenor-place.
1837 Lovat, Patterson's-hotel.
1827 Lyndhurst, 25, George-street.
1794 Lyttleton, 17, St. James's-place.
1807 Manners, 56, Upper Brook-street.
1838 Metheun, 128, Park-street.
1711 Middleton, 11, Montagu-street.
1847 Milford, St. George's-hotel.
1728 Monson, 1, Lincoln's-inn-fields.
1839 Monteagle, 7, Park-street.
1741 Montfort, 24, Upper Montagu-st.
1831 Mostyn, 9, Lower Seymour-street.
1797 Northwich, 44, St. James's-place.
1831 Panmure, 9, Cornwall-terrace.
1603 Petre, 3, Mansfield-street.
1827 Plunket (no address in London).
1831 Poltimore, 25, Grosvenor-square.
1837 Portman, 38, Bryanstone-square.
1821 Ravensworth, Carlton-club.
1821 Rayleigh, United University-club.
1802 Redesdale, 6, Park-place.
1802 Rivers, 16, Bruton-street.
1782 Rodney, 3, Gloucester-place.
1796 Rossmore, Brooks's-club.
1558 St. John, Carlton-club.
1802 Sandys, 48, Curzon-street.
1447 Saye and Sele, 43, Grosvenor-st.
1761 Scarsdale (no town residence).
1840 Seaton, G.C.B., G.C.H., U.S. Club.
1784 Sherborne, 15, Hyde-park-gardens.
1828 Skelmersdale, 55, Portland-place.
1760 Sondes, 3, St. James's-square.
1780 Southampton, 32, Curzon-street.
1640 Stafford, Mivart's-hotel.
1839 Stanley of Alderley, 40, Dover-st.
1448 Stourton, 10, Mansfield-street.
1839 Stuart de Decies, Long's-hotel.
1616 Teynham (no town residence).
1792 Thurlow, Burlington-hotel.
1523 Vaux of Harrowden, Limmer's-hotel.
1762 Vernon (no town residence).
1841 Vivian, Reform-club.
1780 Walsingham, 7, Upper Portland-pl.
1664 Ward, Mivart's-hotel.
1839 Wenlock, 29, Berkeley-square.
1826 Wharncliffe, 9, Upper Brook-street.
1492 Willoughby de Brooke, 21, Hill-st.
1313 Willoughby d'Eresby, 142, Piccadilly.
1797 Wodehouse, Mivart's-hotel.
1838 Wrottesley, Geolo. Soc.
1829 Wynford (no address in London).

IRISH PEERS.

The following Irish Peers have seats in the House of Lords as Peers of the United Kingdom.

1739 Besborough, E. (B. Ponsonby).
1789 Carysfort, E. (B. Carysfort), (no town residence).
1763 Charlemont, E. (B. Charlemont), 49, Lower Grosvenor-street.
1803 Clancarty, E. (V. Clancarty), 16, Suffolk-street.
1825 Clanricarde, M. (B. Somerville), 2, Carlton-house-terrace.
1776 Clanwilliam, E. (B. Clanwilliam), 32, Belgrave-square.
1795 Clare, E. (B. Fitzgibbon), 35, Lowndes-square.
1781 Clifden, V. (B. Mendip), Whitehall.
1816 Conyngham, M. (B. Minster)(abrd.)
1620 Cork, E. (B. Boyle), 3, Hamilton-pl.
1762 Courtoun, E. (B. Saltersford), 11, Green-street.
1797 Cremorne, B. (B. Dartrey), 3, Gt. Stanhope-street.
1725 Darnley, F. (B. Clifton), (no town residence).
1790 Donegal, M. (B. Fisherwick), 28, Lowndes-street.
1800 Donoughmore, E. (V. Hutchinson), 6, Sackville-street.
1789 Downshire, M. (E. Hillsborough), 21, Hanover-square.
1791 Drogheda, M. (B. Moore), (no address in London).
1733 Egmont, E. (B. Lovell), 24, Hill-st.
1801 Ely, M. (B. Loftus), (abroad).
1789 Enniskillen, E. (B. Grinstead), 109, Jermyn-street.
1759 Fife, E., K. T. (B. Fife), Union-club.
1628 Fingall, E. (B. Fingall), Brooks's-club.

1720 Gage, V. (B. Gage), 4, Whitehall-yard.
1806 Gosford, E. (B. Worlingham), Brooks's-club.
1800 Headfort, M. (B. Kenlis), Brooks's-club.
1841 Kenmare, E. (B. Kenmare), 11, Belgrave-square.
1768 Kingston, E. (B. Kingston).
1766 Leinster, D. (V. Leinster), 6, Carlton-house-terrace.
1795 Leitrim, E. (B. Clements), 18, Gt. Cumberland-place.
1803 Limerick, E. (B. Foxford), 7, Clifton-place.
1806 Lismore, V. (B. Lismore), (no town residence).
1816 Londonderry, M. (E. Vane), Holderness-house.
1785 Longford, E. (B. Silchester), 24, Bruton-street.
1660 Massareene, V. (B. Oriel), (no town residence).
1627 Meath, E. (B. Chaworth), (no address in London).
1781 Melbourne, V. (B. Melbourne), 39, South-street.
1717 Middleton, V. (B. Brodrick), (no address in London).
1760 Mornington, E. (B. Maryborough), Mivart's-hotel.
1825 Ormonde, (M. B. Ormonde), 25, Bruton-street.
1831 Ranfurly, E. (B. Ranfurly), 40, Berkeley-square.
1771 Roden, E. (B. Clanbrassill), United Service-club.
1771 Sefton, E. (B. Sefton), 37, Belgrave-square.
1756 Shannon, E. (B. Carleton), Mivart's hotel.
1816 Sheffield, E. (B. Sheffield), 20, Portland-place.
1800 Sligo, M. (B. Monteagle), Farrance's-hotel.
1628 Strangford, V. (B. Penshurst), 68, Harley-st.
1839 Talbot, de Malahide, L. (B. Furnival), Long's-hotel.
1780 Waterford, M. (B. Tyrone), Mivart's-hotel.

SCOTCH PEERS.

The following Scotch Peers have seats in the House of Lords as Peers of the United Kingdom.

1682 Aberdeen, E. (V. Gordon), 7, Argyll-street.
1701 Argyll, D. (B. Sundridge), Hamilton-place.
1703 Atholl, D. (E. Strange), Carlton-club.
1650 Balcarres, E. (B. Wigan), 21, Berkeley-square.
1647 Belhaven, B. (B. Hamilton), 31, Albemarle-street.
1663 Buccleuch, D., K.G. (E. of Doncaster), Whitehall-gardens.
1633 Dalhousie, E. (B. Dalhousie) (abrod.)
1507 Eglinton, E. (B. Androssan), 24, Hill-street.
1453 Errol, E. (B. Kilmarnock) St. James's-palace.
1620 Falkland, V. (B. Hunsdon), Clarendon-hotel.
1623 Galloway, E. (B. Stewart of Garlies), 45, Grosvenor-st.
1703 Glasgow, E. (B. Ross), Clarendon-hotel.
1619 Haddington, E. (B. Melrose), 43, Belgrave-square.
1643 Hamilton, D., K.G. (D. of Brandon), 12, Portland-square.
1599 Huntly, M. (B. Meldrum), 24, Chapel-street.
1682 Kinnaird, L. (B. Rossie), 33, Grosvenor-street.
1704 Kinnoul, E. (B. Hay), 58, Green-st.
1624 Lauderdale, E. (B. Lauderdale), 1, Regent-street.
1707 Montrose, D. (E. Graham), 45, Belgrave-square.
1561 Moray, E. (B. Stuart), (no town residence).
1703 Roseberry, E. (B. Roseberry), 139, Piccadilly.
1707 Roxburgh, D. (E. Innes), (no address in London).
1703 Stair, E. (B. Oxenfoord), (no town residence).
1633 Wemyss, E. (B. Wemyss), 19, Stratford-place.

IRISH REPRESENTATIVE PEERS.

1793 Bandon, E., 6, Hyde-park-terrace.
1621 Blayney, B., 76, Jermyn-street.
1800 Caledon, E., 5, Carlton-ho.-ter.
1812 Castlemaine, B., 57, St. James's-st.
1763 Charlemont, E., 49, Grosvenor-st.
1806 Charleville, E. (no town residence).
1790 Clonbrock, B. (no town residence).
1797 Crofton, P., 12, Bryanstone-sq.
1723 Desart, E., 28, Chapel-street.
1776 De Vesci, V., 57, St. James's-st.
1785 Donoraile, V., 16, Carlton-ho.-ter.
1822 Downes, B., K.C.B., 44, Brook-st.
1800 Dunally, B., Burlington-hotel.
1822 Dunraven, E., 76, Eaton-square.
1461 Dunsany, B., Carlton-club.
1780 Erne, E. (no address in London).
1756 Farnham, B., 44, Brook-street.
1816 Glengall, E., 34, Grosvenor-street.
1806 Gosford, E., G.C.B. Brooks's-club.
1793 Hawarden, V., 5, St. George's-pl.
1806 Lorton, V., 18, Chesham-place.
1806 Rosse, E., Coulson's-hotel.
1795 Lucan, E., 20, Hanover-square.
1785 Mayo, E., G.C.H., 24, Norfolk-st.
1781 Mountcashel, E., 12, Rider-st.
1795 O'Neill, E., United Service-club.
1822 Westmeath, M., 116, Pall Mall.
1793 Wicklow, E., K.P., 2, Cavendish-sq.

SCOTCH REPRESENTATIVE PEERS.

Elected every Parliament.

1639 Airlie, E., Carlton-club.
1609 Colville, B., 29, Portland-place.
1509 Elphinstone, Clarendon-hotel.
1445 Gray, B., Carlton-club.
1605 Home, E. (no address in London).
1690 Leven, E., Carlton-club.
1458 Morton, E., 7, Old Palace-yard.
1696 Orkney, E., 4, St. Alban's-place.
1690 Polwarth, B., Carlton-club.
1651 Rollo, B., 15, Regent-street.
1701 Seafield, E., 57, St. James's-st.
1445 Saltoun, B., 1, Gt. Cumberland-st.
1489 Sinclair, B., United Service-club.
1646 Selkirk, E., Grosvenor-hotel.
1686 Strathallan, V., 44, Charles-street.
1694 Tweeddale, M., K. T. (India).

IRISH BISHOPS.

Four of the Irish Bishops sit by annual rotation in the House of Lords. The following occupy seats at present:—

Archbp. of Dublin. | Bishop of Meath.
Bishop of Cashel. | Bishop of Tuam.

PEERS WHO ARE MINORS.

H. R. H. Albert Edward Prince of Wales, K.G.	Of age 1862
Marquis of Bath	1852
Marquis of Bute	1868
Earl of Coventry	1859
Earl of Dunmore	1862
Earl of Durham	Sep. 8, 1849
Earl of Granard	1854
Marquis of Hastings	1853
Viscount Hood	1859
Earl of Hopetoun	1852
Earl of Kintore	June 7, 1849
Marquis of Lothian	1853
Baron Lurgan	1852
Baron Ribblesdale	April 28, 1849

ELDEST SONS OF PEERS.

The following have seats in the House of Lords.

Title of courtesy	*Sits as*	*Son of*
Bruce, Earl	B. Bruce	M. Ailesbury
Stanley, Lord	B. Stanley	E. of Derby
Uxbridge, Earl	B. Paget	M. Anglesey
Acheson, Vic.	B. Acheson	E. Gosford
Hn. E. J. Stanley	B. Eddisbury	B. Stanley

MEMBERS OF THE HOUSE OF COMMONS.

ENGLAND AND WALES.

498 MEMBERS.

Speaker.—Rt. Hon. C. S. Lefevre.

Abingdon.—Sir F. Thesiger, 11, Bryanstone-square.
Andover.—J. H. Coles, 25, Portman-sq. —W. Cubitt, 3, Park-lane.
Anglesea.—Sir R. B. Bulkeley, Bart., 69, Eaton-square.
Arundel.—Earl of Arundel, 11, Carlton-house-terrace.
Ashburton.—Lt.-Col. T. Matheson, 8, St. James's-street.
Ashton-under-Lyne.—C. Hindley, Dartmouth-house, Westminster.
Aylesbury.—Q. Dick, 20, Curzon-street. Lord Nugent, Reform-club.
Banbury.—H. W. Tancred, 105, Pall Mall.
Barnstaple.—R. Bremridge, 14, Jermyn-street. Hon. J. Fortescue, 17, Grosvenor-square.
Bath.—Viscount Duncan, 15, Hill-street. Lord Ashley, 49, Upper Brook-street.
Beaumaris.—Lord G. Paget, 1, Old Burlington-street.
Bedford.—H. Stuart, 18, Hill-street. Sir H. Verney, Bart., 9, St. James's-pl.
Bedfordshire.—Visc. Alford, 13, Bury-st. F. C. H. Russell, 8, Eaton-place.
Berkshire.—R. Palmer, 16, Suffolk-st. Visct. Barrington, 20, Cavendish-sq. P. Pusey, 1, New-street.
Berwick-upon-Tweed.—M. Foster, 4, New City-chambers. J. C. Renton, Conservative-club.
Beverley.—J. Towneley, 76, Eaton-place. S. W. L. Fox, Jermyn-street.
Bewdley.—Lord Mandeville, 129, Mount-street.
Birmingham.—G. F. Muntz, 5, St. James's square. W. Scholefield, 49, Queen Anne-street.
Blackburn.—J. Hornby, 22, Park-cres. J. Pilkington, Queen's-hotel.
Bodmin.—J. Wyld, Charing-cross East. H. C. Lacy, 52, Bedford-square.
Bolton.—Sir J. Walmsley. Stephen Blair.
Boston.—Sir J. Duke, 38, York-place. B. B. Cabbell, 1, Brick-court.
Bradford.—W. Busfeild, 15, Bury-street. Col. P. Thompson, Free Trade-club.
Brecknockshire.—J. Bailey, 26, Belgrave-square.
Brecon.—J. L. V. Watkins, 8, Suffolk-st.
Bridgnorth.—T. C. Whitmore, Carlton-club. Sir R. Pigot, Bart., 10, Lower Grosvenor-square.
Bridgwater.—H. Broadwood, 9, Argyll-st. C. K. Tynte, 20, Sussex-square.
Bridport.—T. A. Mitchell, 2 6, Albany. B. Cochrane, 33, Belgrave-square.

Brighton.—Capt. Pechell, 6, Stratford-place. Lord A. Hervey, 6, St. James's-square.

Bristol.—P. W. S. Miles, 44, Belgrave-square. Hon. F. Berkeley, 1, Victoria-square.

Buckingham.—Marquis of Chandos, 91, Pall Mall. Col. J. Hall, Hyde-park-barracks.

Buckinghamshire.—Hon. C. Cavendish, Burlington-house. C. Du Pre, 40, Portland-place. B. Disraeli, 1, Grosvenor-gate.

Bury.—R. Walker, 5, Gt. Ryder-st.

Bury St. Edmunds.—Earl Jermyn, 47, Eaton-place. E. H. Bunbury, 15, Jermyn-street.

Calne.—Earl of Shelburne, Lansdowne-house.

Cambridge.—Hon. W. Campbell, Strath-eden-house. A. S. Adair, 7, Audley-square.

Cambridgeshire. — Hon. E. Yorke, 15, Wilton-place. R. Townley, Limmer's-hotel. Lord G. Manners, c 4, Albany.

Cambridge University.—H. Goulburn, 12, Montague-square. Hon. C. E. Law, 72, Eaton-place.

Canterbury.—Hon. G. Smyth, 68, Harley-street. Lord A. Conyngham, 90, Pall Mall.

Cardiff Boroughs.—Rt. Hon. Dr. Nickoll, 35, Great George-street.

Cardigan, &c.—P. Pryse, Limmer's-hot.

Cardiganshire.—Col. W. E. Powell, 7, Hyde-park-terrace.

Carlisle.—W. N. Hodgson, 4, Saville-row. P. H. Howard, 15, Gloucester-place.

Carmarthen, &c.—D. Morris, 8, St. James's-place.

Carmarthenshire.—Hon. G. Trevor, 11, Hyde-park-gardens. D. A. S. Davies, 31, Norfolk-street.

Carnarvon.—W. B. Hughes, 13, King-street, St. James's.

Carnarvonshire.—Hon. E. G. Pennant, 36, Belgrave-square.

Chatham.—Right Hon. Visc. Enfield, 77, Eaton-square.

Cheltenham.—C. L. G. Berkeley.

Cheshire, North. —W. T. Egerton, 43, Wilton-crescent. Geo. C. Legh.

Cheshire, South.—Sir G. Egerton, Bart., 22, Wilton-crescent. J. Tollemache, 40, Wilton-crescent.

Chester.—Earl Grosvenor, 33, Up. Grosvenor-street. Sir J. Jervis, 47, Eaton-square.

Chichester.—Lord H. Lennox, 51, Portland-place. J. A. Smyth, 47, Belgrave-square.

Chippenham.—J. Neeld, 6, Grosvenor-sq. Capt. H. Boldero, 6, Grosvenor-sq.

Christchurch.—Hon. E. Harris, 8, Whitehall-gardens.

Cirencester.—J. R. Mullings, Hatchett's-hotel. Viscount Villiers, 38, Brkly.-st.

Clitheroe.—M. Wilson, 65, Quadrant.

Cockermouth.—H. A. Aglionby, 5, Brick-court. E. Horsman, 6, Up. Brook-st.

Colchester.—Sir G. Smyth, Bart., 14, Crawford-st. J. A. Hardcastle, Oxford and Cambridge-club.

Cornwall, East.—W. H. Carew, 29, Eaton-pl. T. I. A. Robartes, 1, Dean-st.

Cornwall, West.—E. Pendarves, 36, Eaton-pl. Sir C. Lemon, Bart., 46, Charles-st.

Coventry.—Rt. Hon. E. Ellice, 11, Arlington-street. G. J. Turner, 11, New-square.

Cricklade.—J. Neeld, 6, Grosvenor sq. A. L. Goddard, 58, Chester-sq.

Cumberland, East.—Hon. C. Howard, 56, Park-st. W. Marshall, 67, Eaton-square.

Cumberland, West.—E. Stanley, 109, Jermyn-st. H. Lowther, 31, Bruton-st.

Dartmouth.—G. Moffat, 85, Eaton-sq.

Denbigh Borough.—F. R. West, Carlton-club.

Denbighshire.—Sir W. Wynn, Bart., 18, St. James's-sq. Hon. W. Bagot, 1, Carlton-terrace.

Derby.—L. Heyworth. M. T. Bass.

Derbyshire, North.—Hon. G. Cavendish, 4, Belgrave sq. W. B. Evans, Park-house.

Derbyshire, South.—W. Mundy. C. R. Colvile, B 4, Albany.

Devizes.—Lt.-Col. J. B. Estcourt, 64, Coleshill st. G. H. Heneage, Grosvenor-hotel.

Devonport.—H. Tuffnell, 37, Curzon-st. Sir J. Romilly, 6, New-square.

Devonshire, North.—Sir T. Acland, Bt., Waterloo-house. L. W. Buck, 12, Norfolk-street.

Devonshire, South.—Sir J. Buller, Bt., 39, Belgrave square. Sir R. Lopes, Bt.

Dorchester.—Col. G. Damer, A 11, Albany. H. C. Sturt, 16, Portman-square.

Dorsetshire.—H. K. Seymer, 26, Gresham-place. G. Bankes, 5, Old Palace-yd. J. Floyer, 5, Old Palace-yd.

Dover.—Sir G. Clerk, Bart., 8, Park-st. E. R. Rice, 13, Suffolk-street.

Droitwich.—Sir J. S. Pakington, 41, Eaton-square.

Dudley.—J. Benbow, 26, Mecklenburgh-square.

Durham.—T. Granger, 12, King's-bench-walk. H. J. Spearman, 4, St. James's-place.

Durham County, North.—R. D. Shafto, 3, Whitehall-yard. Visc. Seham, 59, Green-street.

Durham County, South.—Lord H. Vane, 1, Grosvenor-place-houses. J. Farrer, 7, John-street, Berkeley-square.

Essex, North.—Sir J. Tyrrell, Bart., Brit.-ho. Major Beresford, 77, Pall Mall.
Essex, South.—T. Bramston, 8, Eccleston-terrace. Sir E. Buxton, Bart., 23, St. James's-place.
Evesham.—Lord M. Hill, 9 Chesham-st. Sir H. Willoughby, Bart., 63, Lower Brook-street.
Exeter.—E. Divett, 79, Eaton sq. Sir J. Duckworth, 109, Jermyn-street.
Eye.—Sir E. Kerrison, Bart., 13, Great Stanhope-street.
Finsbury.—T. Wakley, 1, Bedford-st. T. S. Duncombe, 5 A, Spring-gardens.
Flint Boroughs.—Sir J. Hanmer, Bart., 59, Eaton-place.
Flintshire.—Hon. E. Mostyn, 9, Lower Seymour-street.
Frome.—Major Boyle, 3, Hamilton-pl.
Gateshead.—W. Hutt, 39, Maddox-st.
Glamorganshire.—Viscount Adare, 76, Eaton-square. C. R. M. Talbot, 3, Cavendish-square.
Gloucester.—H. T. Hope, 1, Mansfield-street. Hon. M. Berkeley, Admiralty.
Gloucestershire, East.—Marquis of Worcester, 27, Berkeley-square. Sir C. Codrington, 3, Park-place.
Gloucestershire, West.—Hon. G. Berkeley, Cox's-hotel. R. B. Hale, 15, Bolton-street.
Grantham.—G. E. Welby, 8, Upper Belgrave-street. Hon. F. Tollemache, Carlton-club.
Great Grimsby.—E. Heneage, 39, Charles-street.
Greenwich.—J. W. D. Dundas, Admiralty. E. G. Barnard, Reform-club.
Guildford.—Capt. R. Mangles, 25, Cambridge-square. H. Currie, 37, Green-street.
Halifax.—Sir C. Wood, Bart., 12, Downing-street. Capt. H. Edwards, 27, York-terrace.
Hampshire, North.—C. S. Lefevre (the Speaker). Sir W. Heathcote, Bart., 43, Eaton-place.
Hampshire, South.—H. C. Compton, 34, Upper Eaton st. Lord C. Wellesley, Apsley-house.
Harwich.—Sir J. C. Hobhouse, Bt., 42, Berkeley-sq. J. Bagshaw, 17, Gloucester-place.
Hastings.—M. Brisco, 38, Devonshire-pl. R. Holland, 63, Portland-pl.
Haverfordwest.—J. Evans, 11, Crown-office-row.
Helston.—Sir R. Vyvyan, Bt., Hanover-gate.
Hereford.—Sir R. Price, Bart., 11, Stratton-st. H. Clifford, 11, Chester-st.
Herefordshire.—J. Bailey, jun., 26, Belgrave-sq. G. Lewis, Kent-ho. R. Haggitt, 63, Pall Mall.
Hertford.—Viscount Mahon, 41, Grosvenor-pl. Hn. W. F. Cowper, 39, South-st.
Hertfordshire.—T. P. Halsey, 45, Pall Mall. Sir H. Meux, Bt., 41, Up. Brook-st. T. Brand, Burlington-house.
Honiton.—J. Locke, 6, Chester-ter. Sir W. Hogg, Bart., 16, Grosvenor-sq.
Horsham.—Lord Howard.
Huddersfield.—W R. Stansfield, 22, Charles-st.
Hull.—J. Clay, 25, Montague-sq. M. T. Baines, 2, Paper-buildings.
Huntingdon.—Col. J. Peel, 8, Park-pl. T. Baring, 40, Charles-st.
Huntingdonshire.—E. Fellowes, 3, Belgrave-sq. G. Thornhill, 17, Lower Grosvenor-st.
Hythe.—E. D. Brockman, 196, Strand.
Ipswich.—J. C. Cobbold, 14, Manchester-buildings. H. E. Adair, 2, Chapel-st. W.
Kendal.—G. C. Glyn, 1, Up. Eccleston-st.
Kent, East.—J. P. Plumtre, 3, Old Palace-yard. W. Deedes, 8, Eccleston-ter.
Kent, West.—Sir E. Filmer, 72, Eaton-sq. T. L. Hodges, 15, Suffolk-st.
Kidderminster.—R. Godson, 11, King's-bench-walk.
Knaresborough.—Hon. W. Lascelles, Carlton-club. J. P. Westhead, 1, Chester-terrace.
Lambeth.—C. D'Eyncourt, 35, Pall Mall. C. Pearson, 10, Park-st.
Lancashire, North.—J. W. Patten, 9, Lowndes-sq. J. Heywood, 6, St. James's sq.
Lancashire, South.—W. Brown, Fenton's-hotel. A. Henry, 8, Southwick-ter.
Lancaster.—T. Greene, 19, Duke-st., Westm. R. B. Armstrong, 29, Chester-sq.
Launceston.—Rear-Adm. W. Bowles, 8, Hill-st.
Leeds.—W. Beckett, 18, Upper Brook-st. J. G. Marshall, 37, South-st.
Leicester.—J. Ellis (no town residence). R. Harris (no town residence).
Leicestershire, North.—Lord C. Manners, K 3, Albany. E. B. Farnham, Warren's-hotel.
Leicestershire, South.—Sir H. Halford, Bart., 8, Albert-road. C. W. Packe, 7, Richmond-terrace.
Leominster.—F. Peel. G. Arkwright, D 2, Albany.
Lewes.—Hon. H. Fitzroy, 42, Upper Grosvenor-st. R. Perfect, 14, Gloucester-square.
Lichfield.—Lord A. H. Paget, 19, Bruton-st. Viscount Anson, C 5, Albany.
Lincoln.—Col. C. D. W. Sibthorp, 27, Chester-st. T. B. Hobhouse, 5, Brick-ct.
Lincolnshire, North.—R. A. Christopher, 97, Eaton-sq. Sir M. Cholmeley, 10, Upper Belgrave-st.
Lincolnshire, South.—Sir J. Trollope, 35, Portland-pl. Lord Burghley, 33, Bury-street.
Liskeard.—R. B. Crowder.

Liverpool.—Sir T. Birch, Bart., 5, Jermyn-st. E. Cardwell, 3, Whitehall-gard.

London.—Lord J. Russell, 32, Chesham-pl. J. Pattison, 37, Upper Harley st. Baron L. de Rothschild, 148, Piccadil. J. Masterman, 35, Nicholas-lane.

Ludlow.—H. B. Clive, Carlton-club. Col. Solway, 6, Waterloo-p l.

Lyme Regis.—T. N. Abdy, 65, S. Audley-st.

Lymington.—W. A. Mackinnon, 4, Hyde-park-pl. Col. Keppel, 10, Downing-st.

Lynn Regis.—Viscount Jocelyn.

Macclesfield.—J. Brocklehurst, 33, Milk-st. J. Williams, 26, Wimpole-st.

Maidstone.—A. J. B. Hope, 1, Connaught-pl. G. Dood, 9, Grosvenor-pl.

Maldon.—T. B. Lennard, 9, Hyde-park-ter. D. Waddington, Clarence-cham.

Malmesbury.—Hon. J. K. Howard, 15, Charing-Cross.

Malton.—J. E. Dennison, Burlington-ho. J. W. Childers, 82, Eaton-sq.

Manchester.—Rt. Hon. T. M. Gibson, 50, Wilton-crescent. J. Bright, 51, Wimpole-street.

Marlborough.—Lord E. Bruce, 7, St. George's-place. Major H. B. Baring, 13, Eaton-place.

Marlow.—T. P. Williams, 41, Berkeley-square. Col. B. Knox, 28, Wilton-crescent.

Marylebone.—Sir B. Hall, Bart., 2, St. James's-place. Lord D. C. Stuart, 34, St. James's-place.

Merionethshire.—R. Richards, 21, Park-crescent.

Merthyr Tydvil.—Sir J. J. Guest, Bart., 8, Spring-gardens.

Middlesex.—Lord R. Grosvenor, 107, Park-street. R. Osborne, 3, Charles-st.

Midhurst.—S. H. Walpole, 15, Old-sq.

Monmouthshire.—Lord G. C. Somerset, 22, Arlington-street. C. O. S. Morgan, 9, Pall Mall.

Monmouth Boroughs.—R. J. Blewitt, Reform-club.

Montgomeryshire.—C. W. W. Wynn, 20, Grafton-street.

Montgomery, &c.—D. Pugh, 43, Charles-street.

Morpeth.—Hon. E. G. Howard, 86, Eaton-place.

Newark.—M. Sutton, A 6, Albany. J. Stuart, 19, Hertford-street.

Newcastle-under-Lyne.—S. Christy, 2, Park-street. W. Jackson, 33, Bruton-street.

Newcastle-upon-Tyne.—W. Ord, 17, Berkeley-square. T. E. Headlam, 13, Chancery-lane.

Newport, Isle of Wight.—C. W. Martin, 3, Suffolk-street. W. H. Plowden, 9, Devonshire-place.

Norfolk, East.—H. N. Burroughes, Limmer's-hotel. E. Wodehouse, Limmer's-hotel.

Norfolk, West.—W. Bagge, 46, Half-moon-street. Hon. E. K. Coke, 1, St. James's-street.

Northallerton.—W. B. Wrightson, 22, Upper Brook-street.

Northampton.—R. V. Smith, 20, Saville-row. R. Currie, 4, Hyde-park-ter.

Northamptonshire, North.—T. P. Maunsell, Carlton-club. A. Stafford, 175, Piccadilly.

Northamptonshire, South.—Sir C. Knightly, Bart., 10, Upper Brook-street. R. H. A. Vyse, 16, Carlton-house-terrace.

Northumberland.—Lord Ossulston, 17, South-street. Sir G. Grey, Bart., 14, Eaton-place.

Northumberland, South.—M. Bell, 24, Margaret-st. S. C. H. Ogle, 20, Pall Mall.

Norwich.—Marquis of Douro, 3, Upper Belgrave-st. S. M. Peto, 47, Russell-sq.

Nottingham.—J. Walter, 40, Upper Grosvenor-street. F. O'Connor, Osborne's-hotel.

Nottinghamshire, North.—T. Houldsworth, 16, Suffolk-street. Lord H. Bentinck, 19, Cavendish-square.

Nottinghamshire, South.—T. B. T. Hildyard, 45, Eaton-square. Col. L. Rolleston, 8, Hertford-street.

Oldham.—W. J. Fox, 5, Charlotte-street. J. Duncuft, 38, Craven-st.

Oxford.—J. H. Langston, 143, Piccadilly. W. P. Wood, 12, Gt. George-st.

Oxfordshire.—Lord Norreys, 18, Grosvenor-street. G. Harcourt, 24, St. James's-place. J. Henly, 22, Great George-street.

Oxford University.—Sir R. Inglis, Bart., 7, Bedford-square. Rt. Hon. W. Gladstone, Carlton-house-terrace.

Pembroke, &c.—Sir J. Owen, Bart., Union-club.

Pembrokeshire.—Viscount Emlyn, 3, Tilney-street.

Penryn and Falmouth.—H. Gwynn, 35, Duke-st. F. Mowatt, 14, Devonshire-place.

Peterborough.—Hon. G. Fitzwilliam, Halkin-st. W. G. Cavendish, Burlington-house.

Petersfield.—Sir W. Jolliffe, Bart., 5, John-street.

Plymouth.—Viscount Ebrington, 17, Grosvenor-square. R. Palmer, 11, New-square.

Pontefract.—R. M. Milnes, 26, Pall Mall. S. Martin, 79, Eaton-place.

Poole.—G. R. Phillips, 12, Hill-st. Rt. Hon. G. Robinson, 27, Chester-ter.

Portsmouth.—Rt. Hon. Sir F. T. Baring, Bt., 21, Devonshire-pl. Sir G. Staunton, Bt., 17, Devonshire-st.

Preston.—C. P. Grenfell, 38, Belgrave-square. Sir G. Strickland, Bart., 1, Spring-gardens.

Radnor Boroughs.—Rt. Hon. Sir T. F. Lewis, 21, Grafton-street.
Radnorshire.—Sir J. B. Walsh, Bart., 28, Berkeley-square.
Reading.—F. Pigott, 7, Charles-street. Serjeant Talford, 67, Russell-sq.
Reigate.—T. S. Cocks, 15, Hertford-st.
Retford, East.—Hon. A. Duncombe, 22, Grosvenor-square. Viscount Galway, Boodle's-club.
Richmond.—H. Rich, 47, Mount-street. M. Wyvill, jun., 13, Chester-street.
Ripon.—Sir J. Graham, Bart., 46, Grosvenor-pl. Hon. E. Lascelles, 4, Belgrave-square.
Rochdale.—W. S. Crawford, 8, Upper Baker-street.
Rochester.—R. Bernal, 75, Eaton-square. T. T. Hodges, Clarendon-hotel.
Rutlandshire.—G. J. Heathcote, 12, Berkeley-square. Hon. G. Noel, 9, Cavendish-square.
Rye.—H. B. Curteis, Reform-club.
St. Alban's.—A. Raphael, 10, Great Stanhope-street. G. W. J. Repton, Bolton-street.
St. Ives.—Lord W. Paulett, 19, Curzon-street.
Salford.—J. Brotherton, 7, Manchester-buildings.
Salisbury.—W. J. Chaplin, 1, Adelphi-terrace. C. B. Wall, 14, Berkeley-square.
Sandwich.—Lord C. Paget, 1, Old Burlington-street. C. W. Grenfell, 38, Belgrave-square.
Scarborough.—Sir J. Johnstone, Bart., 27, Grosvenor-sq. Earl Mulgrave, 73, South Audley-street.
Shaftesbury.—R. B. Sheridan, 39, Grosvenor-place.
Sheffield.—J. Parker, 47, Mount-street. H. G. Ward, Admiralty.
Shoreham, New.—Sir C. Burrell, Bart., 5, Richmond-terrace. C. Goring, 1, King-street.
Shrewsbury.—E. H. Baldock, 5, Hyde-park-place. R. A. Slaney, 6, Suffolk-street.
Shropshire, North.—W. O. Gore, 66, Portland-place. J. W. Dod, 37, Jermyn-street.
Shropshire, South.—Hon. H. R. Clive, 53, Lower Grosvenor-st. Viscount Newport, 30, Wilton-crescent.
Somersetshire, East.—W. Miles, 7, Hamilton-place. W. Pinney, 30, Berkeley-square.
Somersetshire, West.—Sir A. Hood, Bart., 43, Wimpole-st. C. A. Moody, 64, Cadogan-place.
Southampton.—C. Cockburn, 3, Harcourt-buildings. B. M. Wilcox, 24, Dorset-square.
South Shields.—J. T. Wawn, 23, Harp-lane.
Southwark.—Ald. Humphery, Hibernian wharf. Sir W. Molesworth, Bart., 87, Eaton-square.
Staffordshire, North.—C. B. Adderley. Lord Brackley, 15 A, Hill-street.
Staffordshire, South.—Hon. G. Anson, 25, Hill-street. Viscount Ingestre, Brompton-park.
Stafford.—D. Urquhart, 28, Clarges-st. Ald. Sidney, 8, Ludgate-hill.
Stamford.—J. C. Herries, New-street. Marquis of Granby, 102, Piccadilly.
Stockport.—J. Kershaw, Free-trade-clb. J. Heald, 3, Old Palace-yard.
Stoke-upon-Trent.—J. L. Ricardo, 31, Lowndes-square. Ald. Copeland, 150, New Bond-street.
Stroud.—W. H. Stanton, 42, St. James's-place. G. P. Scrope, 21, Ebury-place.
Suffolk, East.—E. S. Gooch, 32, St. James's-street. Lord Rendlesham, Long's-hotel.
Suffolk, West.—P. Bennett, jun., 12, Eaton-place. H. S. Waddington, 45, St. James's-place.
Sunderland.—Sir H. Williamson, Bart., 30, Chester-square. G. Hudson, Albert-gate.
Surrey, East.—Hon. P. J. L. King, 38, Dover-street. T. Alcock, 5, Lowndes-street.
Surrey, West.—W. J. Denison, 90, Pall Mall. H. Drummond, 50, Chester-sq.
Sussex, East.—C. H. Frewen, 3, Old Palace-yard. A. E. Fuller, 16, Clifford-street.
Sussex, West.—E. of March, 44, Lowndes-square. R. Prime, 38, Charles-street.
Swansea.—J. H. Vivian, 86, Eaton-sq.
Tamworth.—Sir R. Peel, Bart., Whitehall-gardens. Captain Townsend, 34, St. James's place.
Taunton.—H. Labouchere, 27, Belgrave-square. Sir T. Colebrooke, Bart., 18, Park-lane.
Tavistock.—Hon. E. S. Russell, 3, Carlton-house-terrace J. S. Trelawney, 1, Half-moon-street.
Tewkesbury.—J. Martin, 14, Berkeley-square. H. Brown, 2, Little Smith-street.
Thetford.—Hon. F. Baring, Piccadilly. Earl of Euston, 47, Clarges-street.
Thirsk.—J. Bell, L 3, Albany.
Tiverton.—J. Heathcoat, 5, Warwick-st. Viscount Palmerston, 4, Carlton-gar.
Totnes.—Lord Seymour, 18, Spring-gardens. C. B. Baldwin, 4, Charing-cross.
Tower Hamlets.—Sir W. Clay, Bart., 17, Hertford-street. G. Thomson, 6 A, Waterloo-place.
Truro.—J. E. Vivian, Batt's-hotel. H. Willyams, Truro.
Tynemouth.—R. W. Grey, 47, Belgrave-square.

Wakefield.—G. Sandars, 53, Pall Mall.
Wallingford.—S. W. Blackstone, Carlton-club.
Walsall.—Hon. E. R. Littleton, 7, Lowndes-square.
Wareham.—J. Drax, King-street.
Warrington.—G. Greenhall, Berner's-hotel.
Warwick.—W. Collins, 18, Pall Mall. Sir C. E. Douglas, 27, Wilton-crescent.
Warwickshire, North.—R. Spooner, 40, Duke-street. C. N. Newdegate, 3, Arlington-street.
Warwickshire, South.—E. J. Shirley, 20, Belgrave-square. Lord Brooke, 7, Carlton-gardens.
Wells.—W. G. Hayter, 35, Great George-street. R. Blackmore, 15, Regent-st.
Wenlock.—Hon. G. C. Forester, 21, Charles-street. J. M. Gaskell, 72, Lower Grosvenor-street.
Westbury.—J. Wilson, 15, Hertford-st.
Westminster.—Sir De L. Evans, 26, Bryanstone-square. C. Lushington, 1, Palace-gardens.
Westmorland.—Col. Hon. H. Lowther, 31, Bruton-street. Ald. Thompson, 12, Whitehall-place.
Weymouth.—Col. W. L. Freestun, 30, Green-street. Hon. F. W. C. Villiers, 21, Brook-street.
Whitby.—R. Stephenson, 24, Gt. George-street.
Whitehaven.—R. C. Hildyard, 7, Figtree-court.
Wigan.—R. A. Thickness, 15, Bedford-square. Hon. J. Lindsay, 21, Berkeley-square.
Isle of Wight.—J. Simeon, 19, Eaton-sq.
Wilton.—Vis. Somerton, 3, Seymore-pl.
Wiltshire, North.—T. H. S. Sotherton, 51, Eaton-place. W. Long, 29, Hill-st.
Wiltshire, South.—Hon. S. Herbert, 5, Carlton-gardens. J. Bennett, Limmer's-hotel.
Winchester.—Sir J. B. East, Bt., 99, Eaton-square. I. B. Carter, 6, Whitehall.
Windsor.—Col. G. A. Reid, 31, Cavendish-square. Lord J. Hay, Admiralty.
Wolverhampton.—Hon. C. P. Villiers, 14, St. James's-square. T. Thornley, 21, Regent-street.
Woodstock.—Marquis of Blandford, 3, Wilton-terrace.
Worcester.—O. Ricardo, 71, Eaton-place. F. Rufford, 67, St. James's-street.
Worcester, East.—Capt. Rushout, 10, Bolton-street. J. H. H. Foley, 17, Eaton-place.
Worcester, West.—Lt.-Gen. H. B. Lygon, 16, Grosvenor-place. F. W. Knight, 10, Dover-street.
Wycombe.—G. H. Dashwood, 10, Upper Seymour-street. M. T. Smith, 13, Upper Belgrave-street.
Yarmouth.—J. Sandars, 4, St. James's-place. C. E. Rumbold, 1, Albemarle-st.
York.—J. G. Smyth, 17, Lowndes-sq. W. M. E. Milner, 75, Eaton-place.
Yorkshire, East.—H. Broadley, 3, Charles-street. Lord Hotham, 7, Hill-street.
Yorkshire, North.—E. S. Cayley, 107, Jermyn-street. Hon. O. Duncombe, 24, Arlington-street.
Yorkshire, West.—R. Cobden, 103, Westbourne-ter. E. Denison, Duke-st., Wmr.

IRELAND.
105 Members.

Antrim County.—N. Alexander, Carlton-club. Sir E. Macnaghten, 42, Upper Brook-street.
Armagh.—Col. Rawdon, 3, Great Stanhope-street.
Armagh County.—Col. J. Cauldfield, 15, Green-street. Sir W. Verner, Bart., 68, Eaton-square.
Athlone.—W. Keogh, 14, Wilton-street.
Bandon Bridge.—Viscount Bernard, 6, Hyde-park-terrace.
Belfast.—R. J. Tennent, 2, Suffolk-pl. Lord Chichester, 8, St. George's-pl.
Carlow.—J. Sadleir, Queen's-hotel.
Carlow County.—Col. H. Bruen, 11, Gloucester-terrace. W. B. Bunbury, 27, Duke-street.
Carrickfergus.—Hon. W. H. S. Cotton, 36, Hill-street.
Cashel.—T. O'Brien, 14, Jermyn-street.
Cavan County.—J. Young, 19, Chesham-place. Hon. J. P. Maxwell, 46, Duke-street.
Clare County.—Maj. W. Macnamara, Jun. Uni. Service-club. Sir L. O'Brien, Bt., 68, Lowndes-square.
Clonmel.—Hon. C. Lawless.
Coleraine.—Dr. J. Boyd, 2, Pall Mall.
Cork.—W. Fagan, 10, Great Queen st. D. Gallagan, 8, Suffolk-street.
Cork County.—E. B. Roche, 61, Chancery-lane. Dr. M. Power, 11, Air-st.
Donegal County.—Sir E. S. Hayes, 15, Chesham-street. T. Conolly, 52, Jermyn-street.
Down County.—Vis. Castlereagh, 25, Chesham-place. Lord E. Hill, 5, Bolton-street.
Downpatrick.—R. Ker, 104, Regent-st.
Drogheda.—Sir W. M. Somerville, 62, Lowndes-square.
Dublin.—E. Grogan, Carlton-club. J. Reynolds, 3, Queen-square, Westmstr.
Dublin County.—J. H. Hamilton, 24, Motcombe-street. Col. T. E. Taylor, 4, Carlton-house-terrace.
Dublin University.—J. Napier, 3, Old Palace-yard. G. A. Hamilton, 20, Chester-street.
Dundalk.—W. T. M'Cullagh, 32, Suffolk-street.

Dungannon.—Viscount Northland, 5, Bolton-row.
Dungarvon.—R. L. Shcil, 73, Eccleston-square.
Ennis.—O'Gorman Mahon, Albany-st.
Enniskillen.—Hon. H. A. Cole, 109, Jermyn-street.
Fermanagh.—Capt. M. Archdall, A 12, Albany. Sir A. Brooke, Bart., Carlton-club.
Galway.—M. J. Blake, Reform-club. A. O'Flaherty, 20, Jermyn-street.
Galway County.—Sir T. J. Burke, Bart., 112, Jermyn-street. C. St. George, 14, Jermyn-street.
Kerry County.—H. A. Herbert, 3, Grosvenor-crescent. M. J. O'Connell, 39, Duke-street.
Kildare County.—Marq. of Kildare, 6, Carlton-house-terrace. R. S. Bourke, 26, Norfolk-street.
Kilkenny.—M. Sullivan, 5, Suffolk-pl.
Kilkenny County.—P. S. Butler, Delahay-street. J. Greene, 4, Charles-st.
King's County.—Sir A. Armstrong, Bt., 110, Sloane-street. Hon. J. Westerna, Reform-club.
Kinsale.—B. Hawes, 2, Queen-street West.
Leitrim County.—E. K. Tenison, 5, Eaton-place West. Hon. C. Clements, 2, Grosvenor-square.
Limerick.—J. O'Connell, 39, Duke-st. J. O'Brien, Reform-club.
Limerick County.—W. Monsell, 76, Eaton-square. W. S. O'Brien.
Lisburn.—Sir H. B. Seymour, 28, St. James's-place.
Londonderry.—Sir R. A. Ferguson, Bt., 16, Suffolk-street.
Londonderry County.—T. Bateson, c 3, Albany. Captain T. Jones, 30, Charles-street.
Longford County.—R. M. Fox, 3, Queen-street. S. Blackall, jun., 12, Craven-street.
Louth County.—R. M. Bellew, 1, Clifford-street. C. Fortescue, 42, Jermyn-street.
Mallow.—Sir C. D. J. Norreys, Bt., 13, Regent-street.
Mayo County.—G. H. Moore, 9, Little Rider-street. R. D. Browne, Reform-club.
Meath County.—H. Grattan, 26, Sackville-street. M. E. Corbally, 20, Regent-street.
Monaghan County.—Hon. V. Dawson, 3, Great Stanhope-street. C. P. Leslie, 48, Berkeley-square.
New Ross.—J. H. Talbot, 151, Regent-street.
Newry.—Visct. Newry and Morne, 63, Eaton-place.
Portarlington.—Col. Dunne, 53, Jermyn-street.
Queen's County.—J. W. Fitzpatrick, 20, Hyde-park-square. Hon. T. Vesey, 1, Grafton-street.
Roscommon County.—F. French, 54, Parliament-street. O. D. Grace, 38, Duke-street.
Sligo.—J. P. Somers, Reform-club.
Sligo County.—W. R. O. Gore, 66, Portland-place. J. Ffolliott, 14, St. James's place.
Tipperary County.—N. R. Maher, 13, Upper Fitzroy-street. F. Scully, Reform-club.
Tralee.—M. O'Connell, Reform-club.
Tyrone County.—Hon. H. T. L. Corry, 24, Grosvenor square. Lord C. Hamilton, Argyle-house.
Waterford.—Sir H. W. Barron, 21, Cavendish-square. T. Meagher, Ford's hotel.
Waterford County.—N. M. Power. R. Keating, 2, Bedford-row.
Westmeath County.—Sir P. F. Nugent, Queen's-hotel. W. Magan, 22, King-st.
Wexford.—J. T. Devereux, 3, James-st.
Wexford County.—J. Fagan, 11, Great Queen-street. H. K. G. Morgan, 7, Lower Brook-street.
Wicklow County.—Sir R. Howard, 17, Belgrave-square. Viscount Milton, 4, Grosvenor-square.
Youghal.—T. C. Anstey, New-square.

SCOTLAND.
53 MEMBERS.

Aberdeen.—Capt. Fordyce, Cox's-hotel, Jermyn-street.
Aberdeenshire.—Hon. W. Gordon, Argyle-house, Argyle-street.
St. Andrew's.—E. Ellice, jun., 18, Arlington-street.
Argyllshire.—Rt. Hon. D. M'Neill, 39, St. James's-place.
Ayr.—Lord J. C. Stuart, 6, Whitehall-pl.
Ayrshire.—A. Oswald, 14, Arlington-st.
Banffshire.—James Duff, 5, Warwick-st.
Berwickshire.—Hon. Francis Scott, 6, Whitehall.
Buteshire.—Hon. J. S. Wortley, 29, Berkeley-square.
Caithness-shire.—G. Traill, Steven's-hotel, Bond-street.
Clackmannanshire.—Maj.-Gen. Morison, 16, Saville-row.
Dumbartonshire.—A. Smollett, 1, St. Alban's-place.
Dumfries.—Wm. Ewart, 6, Cam.-square, Hyde-park.
Dumfriesshire.—Visct. Drumlanrig, 16, Chester-street.
Dundee.—G. Duncan, 6, Belgrave-st. South.
Edinburgh.—W. G. Craig, 22, Lowndes-square. C. Cowan, 14, St. James's-square.

Edinburghshire.—Sir J. Hope, 3, St. Alban's-place.
Elgin.—G. S. Duff, 130, Piccadilly.
Elginshire.—C. L. C. Bruce, 1, St. Alban's-place.
Falkirk.—Earl of Lincoln, 19, Whitehall-place.
Fifeshire.—I. Fergus, Reform-club.
Forfarshire.—Ld. J. F. Hallyburton, Kensington-palace.
Glasgow.—J. MacGregor, Porchester-tr. A. Hastie, 12, Cleveland-row.
Greenock.—Lord Melgund, 50, Eaton-sq.
Haddington.—Sir H. R. Davie, 48, Wilton-crescent.
Haddingtonshire.—Hon. F. Charteris, 27, Chesham-street.
Inverness-shire.—H. J. Baillie, jun., 1, Seamore-place.
Inverness.—A. Matheson, Orient. and Ref. clubs.
Kilmarnock.—Hon. E. P. Bouverie, 19, Chester-street.
Kincardineshire.—Hon. Lt.-Gen. Arbuthnot, 5 H, Albany.
Kirkaldy.—Lieut.-Col. Ferguson, 43, Clarges-street.
Kircudbright.—T. Maitland, 38, Chester-square.
Lanarkshire.—W. Lockhart, 236, Grosvenor-street.
Leith.—Rt. Hon. A. Rutherford, Gwydir-house.
Linlithgowshire.—G. Dundas, 26, Pall Mall.
Montrose.—J. Hume, 6, Bryanston-sq.
Orkney and Shetland.—A. Anderson, 122, Leadenhall-street.
Paisley.—A. Hastie, 5, Rutland-gate.
Peeblesshire.—W. F. Mackenzie, 5, St. Alban's-place.
Perth.—Rt. Hon. F. Maule, 38, Lower Grosvenor-street.
Perthshire.—H. H. Drummond, 123, Pall Mall.
Renfrewshire.—Col. Mure, 14, Curzon-st.
Ross and Cromarty.—T. Matheson, Cleveland-row.
Roxburghshire.—Hon. J. E. Elliott, 41, Wilton-crescent.
Selkirkshire.—A. E. Lockhart, 236, Grosvenor-street.
Stirling.—J. B. Smith, 105, Westbourne-terrace.
Stirlingshire.—W. Forbes, 83, Jermyn-street.
Sutherlandshire.—Sir D. Dundas, 13, King's-bench-walk.
Wick.—J. Loch, 12, Albemarle-street.
Wigton.—Sir J. M'Taggart, 8, Holles-st.
Wigtonshire.—Capt. J. Dalrymple, 30, Albemarle-street.

CLERKS AND OFFICERS OF BOTH HOUSES OF PARLIAMENT.

PEERS.

Speaker.—Ld. Cottenham (Ld. Chancel.)
Speakers by Royal Com.—Earl of Shaftesbury (Chairman of Committee), Lord Denman.
Gent. Usher of Black Rod.—Sir A. W. Clifford, Bart.
Serj. at Arms.—Lt.-Col. A. Perceval.
Clerk of Parl.—Rt. Hon. Sir G. H. Rose.
Clerk Assist.—J. G. S. Lefevre.
Add. Clerk Assist.—W. Rose.
Reading Clerk and Clerk of Priv. Com.—L. Edmunds.
Counsel to Chairman of Com.—R. Palk.
Clerk of Journals.—Edward Parratt.
Chief Clerk.—H. S. Smith.
Librarian.—J. F. Leary.

COMMONS.

Serj. at Arms.—Lord C. J. F. Russell.
Chief Clerk.—J. H. Ley.
Clerk Assistant.—W. Ley.
Chaplain.—Rev. G. T. Andrews, M.A.
Librarian.—T. Vardon, Ass. Hon. G. Waldegrave.
Sec. to Speak.—C. E. Lefroy.

HER MAJESTY'S CHIEF OFFICERS OF STATE.

First Lord of the Treasury	Right Hon. Lord J. Russell.
Lord High Chancellor	Right Hon. Lord Cottenham.
Chancellor of the Exchequer	Right Hon. Sir C. Wood, Bart.
Lord President of the Council	Right Hon. Marquis of Lansdowne.
Lord Privy Seal	Right Hon. Earl Minto.
Secretary of State, Home Department	Right Hon. Sir G. Grey, Bart.
Secretary of State, Foreign Affairs	Right Hon. Viscount Palmerston.
Secretary of State for the Colonies	Right Hon. Earl Grey.
First Lord of the Admiralty	Right Hon. F. T. Baring.
President of the Board of Control	Right Hon. Sir J. C. Hobhouse, Bart.
President of the Board of Trade	Right Hon. H. Labouchere.
Paymaster-General	Right Hon. Earl Granville.
Postmaster-General	Right Hon. Marquis of Clanricarde.
First Commissioner of Woods & Forests	Right Hon. Earl Carlisle.
Chancellor of the Duchy of Lancaster	Right Hon. Lord Campbell.

The above form the Cabinet.

Commander-in-Chief	His Grace the Duke of Wellington.
Secretary at War	Right Hon. F. Maule.
Master-General of the Ordnance	Marquis of Anglesey.
Master of the Mint	Right Hon. R. L. Shiel, M.P.
Advocate-General	Right Hon. Sir W. G. Hayter, Q.C., M.P.
Vice-President of the Board of Trade	Earl Granville.
Secretary to Board of Control	T. Wyse.
Surveyor-General of the Ordnance	Maj.-Gen. C. R. Fox.
Clerk of the Ordnance	Col. Hon. G. Anson, M.P.
Storekeeper of the Ordnance	Capt. Sir T. Hastings.
Under Secretary of State, Colonies	B. Hawes, M.P.
Under Secretary of State, Foreign	Lord Eddisbury.
Under Secretary of State, Home	H. Waddington.
Joint Secretaries to Treasury	J. Parker; H. Tuffnell.
Secretary to the Admiralty	H. G. Ward, M.P.
Attorney-General	Sir J. Jervis, M.P.
Solicitor-General	Sir J. Romilly, M.P.
Lord Lieutenant of Ireland	Right Hon. the Earl of Clarendon.
Chief Secretary	Sir W. M. Somerville, Bart.
Lord Chancellor	Right Hon. M. Brady.
Lord Advocate for Scotland	Right Hon. A. Rutherford, M.P.
Solicitor-General	Hon. W. G. Hayter, M.P.

TREASURY.

Lords Commissioners. — Rt. Hon. Lord J. Russell; Rt. Hon. Sir C. Wood, Bt.; Earl of Shelborne; R. M. Bellew; H. Rich; W. G. Craig.
Joint Secs.—H. Tuffnell; J. Parker.
Principal Clerk.—S. R. M. Leake.
Solicitor.—G. Maule.
Accountant.—J. Miller.

PRIVY COUNCIL.

Clerks in Ord.—C. C. F. Greville; Hon. W. Bathurst.
Chief Clerk.—J. B. Lennard.
Appeal Clerk.—H. Reeve.
Clk. for Cler. Returns.—Rev. W. Harness, M.A.

EXCHEQUER.

Comptroller.—Lord Monteagle.
Chief Clerk.—G. F. Frederick.
Accountant.—F. P. Ottey.

COLONIAL OFFICE.

Under Secs.—B. Hawes; H. Merrivale, T. F. Elliott.
Chief Clerk.—P. Smith.

FOREIGN OFFICE.

Under Secs.—Lord Eddisbury; H. W. Addington.
Chief Clerk.—G. L. Conyngham.

WOODS AND FORESTS.

Commissioners.—Rt. Hon. Earl of Carlisle; A. Milne; Hon. C. A. Gore.
Chief Clerks.—G. Cornell; J. Burke.
Official Sec.—T. W. Phillips.

BOARD OF TRADE.

Vice-Pres.—Earl Granville.
Direct. Statis. Dep.—W. A. Fonblanque; *Deputy.*—W. D. Oswald.
Secs.—G. R. Porter; Sir D. le Marchant, Bt.

BOARD OF CONTROL.
Pres.—Sir J. C. Hobhouse.
Secs.—T. Wyse; J. Wilson.

HOME OFFICE.
Und. Secs.—H. Waddington; G. C. Lewis.
Chief Clerk.—T. H. Plaskett.

QUEEN'S MINT.
Mast. Work.—R. L. Sheil.
Comptroller.—W. H. Barton.
Chief Medallist.—B. Pistrucci.
Assayer.—H. Bingley.

STATE PAPER OFFICE.
Keeper.—Right Hon. H. Hobhouse.
Chief Clerk.—R. Lemon.

CUSTOMS.
Commissioners.—Sir T. F. Fremantle, Bart. (Chairman); Rt. Hon. G. Dawson (Dep. Chairman); H. Richmond; S. G. Lushington; C. C. Smith; Hon. S. E. S. Rice; F. Goulbourn; T. P. Dickinson; Capt. Saurin.
Sec.—C. A. Scovell.
Surv.-Gen.—C. Dowding; A. Ross; P. Jennings; C. Boyd; T. Howe.
Inspec.-Gen.—W. Irving.

EXCISE.
Commissioners.—J. Wood (Chairman); H. Davis (Dep. Chairman); T. Harrison; H. F. Stephenson; Hon. W. H. Percy; C. J. Herries; C. Ross.
Sec.—J. C. Freeling.

STAMPS AND TAXES.
Chairman.—H. L. Wickham.
Commissioners.—C. P. Rushworth; H. S. Montagu; A. Montgomery.
Sec.—C. Pressly.
Solicitor.—J. Timms.

IRISH OFFICE.
Chief Sec.—Sir W. Somerville, Bart.
Chief Clerk.—G. Trundle.

RAILWAY COMMISSION.
Commissioners.—Rt. Hon. H. Labouchere (Chairman); Earl Granville; Rt. Hon. Sir E. Ryan; Lt.-Col. R. C. Alderson, R.E.
Sec.—Capt. Harness, R.E.
Regist.—D. M'Gregor.

GENERAL REGISTER OFFICE.
Reg.-Gen.—G. Graham.
Chief Clerk.—T. Mann.
First Clerk of Records.—E. Edwards.

DUCHY OF CORNWALL.
THE PRINCE OF WALES'S COUNCIL.
His Royal Highness Prince Albert, K.G.
The Earl of Lincoln.
Lord De L'Isle and Dudley.
Maj.-Gen. Sir H. Wheatley, G.C.H.
The Right Hon. T. P. Leigh.
Right Hon. the Earl of Carlisle.
Lord Portman.
G. E. Anson.
Sec.—J. R. Gardiner.

OFFICERS.
Lord Warden of Stan. & Chief Stew. of Duchy in Cornwall & Devon.—H.R.H. Prince Albert.
Sec. to L. W. & Keep. of Rec. of Duchy.—J. R. Gardiner.
Chanc. & Keep. of Gt. Seal.—The Right Hon. T. P. Leigh.
Surv.-Gen.—Lord De L'Isle and Dudley.
Auditor.—E. White.
Rec.-Gen.—Maj.-Gen. Sir H. Wheatley, G.C.H.
Dep.-Rec.—B. Tucker.
Att.-Gen.—The Hon. J. C. Talbot, Q.C.
Sol.-Gen.—E. Smirke.
Sheriff of Cornwall.—A. Coryton.
Surv. of Land & Min. in Cornw. & Devon.—R. Taylor.
Surv. of Lands in Somerset, Dorset, & Wilts.—R. Watt.
Mineral Agent.—J. W. Colenso.
Rang. & Mast.-Forest. of F. of Dartmoor.—H. R. H. Prince Albert, K.G.

DUCHY OF LANCASTER.
Chanc.—The Right Hon. Lord Campbell.
Att.-Gen.—T. F. Ellis.
Rec.-Gen.—Col. C. R. Fox, M.P.
Auditor.—J. G. Lockhart.
Clerk of Coun. & Regist.—F. D. Danvers.

COMMITTEE OF PRIVY COUNCIL FOR TRADE.
Pres.—Rt. Hon. the Earl of Clarendon, G.C.B.
Vice-Pres.—Rt. Hon. T. M. Gibson, M.P.
Committee.—Archbishop of Canterbury, Lord Chancellor, First Lord of the Admiralty, the Principal Secretaries of State, Chancellor of the Exchequer, Speaker of the House of Commons, Chancellor of the Duchy of Lancaster, Paymaster-General, Master of the Mint, those Officers of State in Ireland who are Privy Councillors in England, Bishop of London.
Joint Secs.—J. M'Gregor; J. G. S. Lefevre.

PRIVY SEAL OFFICE.
Lord Privy Seal.—The Right Hon. the Earl Minto, G.C.B.
Patent Clerks.—J. G. Donne; R. Eden.
Clerk.—W. Goodwin.
Keep. of Rec. & Receiv. of Fees.—R. Eden.

EXCHEQUER (RECEIPT OF).
Comp.-Gen.—Rt. Hon. Lord Monteagle.
Chief Clerk.—F. F. Ottey.
Accountant.—G. S. Frederick.

PUBLIC WORKS LOAN OFFICE.

Acts 57 Geo. III., cap. 34 & 124—3 Geo. IV., cap. 86—1 & 2 Wm. IV., cap. 24—4 & 5 Wm. IV., cap. 72—1 Vict., cap. 51—1 & 2 Vict., cap. 88, & 3 Vict., cap. 10—5 Vict., Sess. 2, cap. 9.

Chairman.—B. Harrison.
Dep. Chairman.—G. Hathorn.
C. Bosanquet; Earl Fortescue, P.C.; Sir T. D. Acland, Bart., M.P.; Sir T. S. Gooch, Bart.; Lord Hatherton, P.C.; T. G. B. Estcourt, M.P.; W. W. Whitemore; J. Loch; H. Warburton, M.P.; Sir B. Heywood, Bart.; Right Hon. H. Labouchere, M.P.; J. Thornton; J. Berens; S. M. Phillips; A. Colville; J. Olive; J. Reid; N. Garry; Sir J. H. Pelly, Bart.; J. H. Palmer; A. G. Robarts, jun.; T. Baring, M.P.; G. W. Norman; G. C. Glyn; S. J. Loyd; W. Ward.
Sec.—J. S. Brickwood.

PUBLIC RECORD OFFICE.

Head Office.—Rolls-house, Chancery-la.
Branch Office.—Rolls-chapel, Rolls-yd. Tower; Chapter-house, Poets' Corner; and Carlton-ride. Office hours, 10 to 4.
Keep. & Custos of Rec.—The Master of the Rolls.
Dep.-Keep.—Sir F. Palgrave, K.H.
Sec.—F. S. Thomas.

COLONIAL LAND AND EMIGRATION BOARD.

Commissioners.—T. W. C. Murdock; C. A. Wood; F. Rogers.
Sec.—S. Walcott.

ENCLOSURE COMMISSIONERS FOR ENGLAND & WALES.

Chief Com.—Rt. Hon. Earl of Carlisle.
Comms.—G. Darby; W. Blamire.
Sec.—H. C. Mules.

ECCLESIASTICAL COMMISSIONERS FOR ENGLAND.

The Archbishops and Bishops of England and Wales; the Lord Chancellor; First Lord of the Treasury; President of the Council; Secretary of State for the Home Department and Chancellor of the Exchequer; the Two Lord Chief Justices of England; the Master of the Rolls, and Lord Chief Baron, and the Judges of the Prerogative and Admiralty Courts; the Deans of Canterbury, St. Paul's, and Westminster; the Earls of Devon, Chichester, and Harrowby; the Right Hon. H. Hobhouse; Right Hon. J. R. G. Graham, Bart., M.P.; Right Hon. Sir G. Grey, Bart., M.P.; J. Nicholl, D.C.L., M.P.
Treas. & Secs.—C. K. Murray; Earl of Harrowby; J. G. S. Lefevre, C.B.
Solicitors.—Messrs. J. Meadows White, & J. Murray.
Assist.-Sec.—J. J. Chalk.
Architect.—W. Railton.
Surrs.—Messrs. R. Clutton, J. Clutton, & J. Pickering.
Aud. & Act.—A. Morgan.
Accountant.—B. R. Aston.
Office-Keep. & Mess.—J. Bubb.

EASTLAND COMPANY.

Governor.—S. Thornton.
Dep.-Gov.—J. Cattley.
Treas.—Hon. J. T. L. Melville.
Sec.—T. Cope.

COMMISSIONERS FOR PROMOTING THE FINE ARTS.

Commissioners.—H. R. H. Prince Albert, K.G.; Right Hon. Lord Lyndhurst; Right Hon. Duke of Sutherland, K.G.; Right Hon. Marquis of Lansdowne, K.G.; Right Hon. Earl of Lincoln, M.P.; Earl of Shrewsbury; Right Hon. Earl of Aberdeen, K.T.; Right Hon. Viscount Canning; Right Hon. Lord J. Russell, M.P.; Right Hon. Earl of Ellesmere; Right Hon. Earl of Carlisle; Right Hon. Viscount Palmerston, M.P.; Viscount Mahon, M.P.; Lord W. de Eresby; Lord Colborne; Right Hon. C. S. Lefevre, M.P.; Right Hon. Sir R. Peel, Bart., M.P., P.C.; Right Hon. Sir J. R. G. Graham, Bart., M.P., P.C.; Sir R. H. Inglis, Bart., M.P.; Right Hon. T. B. Macaulay, M.P.; B. Hawes, jun., M.P.; H. Hallam, F.R.S.; S. Rogers, F.R.S.; G. Vivian; T. Wyse.
Sec.—C. L. Eastlake, R.A.

STATISTICAL DEPARTMENT.

Chief.—G. R. Porter.
Assistants.—W. D. Oswald; R. Valpy.
Clerks.—T. Irving; C. A. G. Sivrac; T. P. Ward; H. Baring.

OFFICE OF REGISTRAR OF DESIGNS.

Regist.—C. Johnson.
Assist.-Regist.—Hon. E. C. Curzon.
Clerk.—J. H. Bowen.
Second Clerk.—H. C. Woollett.
Office-Keep.—C. Tristom.
Mess.—J. Pastell.

POST OFFICE (General).

Postmaster-Gen. for U. Kingdom.—The Most Noble U. J., Marquis of Clanricarde, K.P.
Sec.—Lieut.-Col. W. L. Maberley.
Sec. to Postm.-Gen.—R. Hill.
Assist.-Sec.—J. Tilley.
Inspect.-Gen.—J. Ramsey.
Prin. Sec. to Postm.-Gen.—G. C. Cornwall.
Chief Clerk to Sec.—C. Johnson.

AUDIT OFFICE FOR PUBLIC ACCOUNTS.

Commissioners.—Col. Sir W. L. Herries, C.B., K.C.H. (Chairman); H. F. Luttrell; H. Arbuthnot; E. Romilly; Sir A. G. Grant, Bart.
Sec.—R. M. Bromley.

ARCHITECTURAL AND ENGINEERING WORKS.

Director.—Lieut.-Col. A. Irvine, C.B.
Chief Assist.—W. Scamp.

ROYAL OBSERVATORY, GREENWICH.

Astron. Royal & Sup. of Chronometers.—G. B. Airy, M.A., F.R.S.
First Assist.—Rev. R. Main, M.A.
Sup. of Naut. Almanack.—Lieut. W. S. Stratford, R.N.

COURT OF BANKRUPTCY.

Birmingham.—J. Balguy, Q.C.; R. Daniell.
Liverpool.—W. Skirrow; — Perry.
Manchester.—E. Ludlow, Serjeant; W. Jemmett.
Leeds.—M. West; W. S. Ayrton.
Bristol.—H. J. Stephen, Serjeant; R. Stevenson.
Exeter.—E. Goulburn, Serjeant.
Newcastle.—N. Ellison.

SOUTH-SEA COMPANY.

Governor.—C. Bosanquet.
Sub-Gov.—C. Franks.
Dep.-Gov.—Hon. P. P. Bouverie.
Cashier.—J. T. Viner.
Sec.—C. F. Gibson.
Accountant.—W. R. Arnold.

COMMISSIONERS FOR THE REGISTRATION AND REGULATION OF COAL-WHIPPERS IN THE PORT OF LONDON.

[Under the Act 9 & 10 Vict., c. 96.]
Commiss. app. by Lords of Com. of Privy Coun. for Trade.—C. Green (Chairman); R. Gamman; V. H. Hobart; T. Wood.
Commiss. app. by Com. Coun. of City of London.—T. Pewtress (Vice-Chair.); W. Cash; J. Dixon; G. Stacy.
Commiss. in Term of Act.—G. F. Young.
Regist.—J. Barber.

INCORPORATED LAW SOCIETY.

Pres.—B. Austen.
Vice-Pres.—T. Clarke.
Sec.—R. Maughan.

SOCIETY FOR PROTECTION OF AGRICULTURE.

Pres.—The Duke of Richmond.
Vice-Pres.—The Duke of Buckingham.
Sec.—H. Dyson.

DIRECTORS OF THE EAST-INDIA COMPANY, 1849.

Lt.-Gen. Sir J. L. Lushington, *Chairman.* Maj.-Gen. A. Galloway, C.B., *Dep.-Ch.*

W. Wigram.	H. Shank.	W. H. C. Plowden, M.P.
J. Loch.	R. Ellice.	E. Macnaghten.
C. Mills.	Sir R. Jenkins, G.C.B.	Major J. Oliphant.
J. Masterman, M.P.	J. Cotton.	Hon. W. H. L. Melville.
J. P. Muspratt.	W. B. Bayley.	R. D. Mangles, M.P.
H. St. George Tucker.	J. Shepherd.	Maj.-Gen. J. Caulfield, C.B.
H. Alexander.	F. Warden.	
G. Lyall.	M. T. Smith, M.P.	

The following gentlemen are out by rotation:—Sir R. Campbell, Bart.; W. J. Eastwick; Sir J. W. Hogg, Bart., M.P.; Lieut.-Col. W. H. Sykes; J. C. Whiteman; Sir H. Willock, K.L.S.

GOVERNORS AND DIRECTORS OF THE BANK OF ENGLAND.

Governor.—J. Morris. *Dep.-Gov.*—H. J. Prescott.

T. Baring.	K. D. Hodgson.	G. Lyall, jun.	J. Pattison.
H. W. Blake.	H. L. Holland.	T. Masterman.	Sir J. H. Pelly, Bt.
E. H. Chapman.	J. G. Hubbard.	A. Matheson.	T. C. Smith.
W. Cotton.	T. N. Hunt.	H. St. J. Mildmay.	W. Thompson, Ald.
J. O. Hanson.	C. F. Huth.	G. W. Norman.	T. M. Weguelin.
J. B. Heath.	A. Latham.	J. H. Palmer.	F. Wilson.

Sec.—J. Knight. *Chief Accountant.*—W. Smee.

LONDON BANKERS.

Agra and United Service Bank, 15, Old Jury-chambers.
Bank of Australasia, 8, Austin Friars.
Bank of Australia, 2, Moorgate-street.
Bank of British North America.
Bank of England.
Barclay, Bevan, Tritton, & Co., 54, Lombard-street.
Barnard, Dimsdale, & Co., 50, Cornhill.
Barnett, Hoare, Hoare, & Bradshaw, 62, Lombard-street.
Biggerstaff, W. & J. S., West Smithfield.
Bosanquet, Anderson, Franks, & Co., 73, Lombard-street.
Bauer & Co., 113, Leadenhall-street.
Bouverie & Co., 11, Haymarket.
British Colonial Bank and Loan Comp., 50, Moorgate-street.
Brown, Janson, & Co., 32, Abchurch-la.
Bult, Son, & Co., 95 & 96, Cheapside.
Call, Sir W. P., Bart., Martin, & Co., 25, Old Bond-street.
Child & Co., 1, Fleet-street.
Cocks, Biddulph, & Biddulph, 43, Charing-cross.
Cockburn & Co., 4, Whitehall.
Colonial Bank, 13, Bishopsgate-st.-within
Commercial Bank of London.
Coutts & Co., 59, Strand.
Cunliffe, Roger, 24, Bucklersbury.
Cunliffes, Brooks, & Co., 29, Lombard-st.
Curries & Co., 29, Cornhill.
Davies, R., & Co., 167, Shoreditch.
De Lisle, Janvrin, & Co., 16, Devonshire-square.
Dixon, Brooks, & Dixon, 25, Chancery-lane.
Denison, Heywood, & Co., 4, Lombard-street.
Drewett & Fowler, 4, Princes-st., Bank.
Drummond & Co., 49, Charing-cross.
Feltham, J., & Co., 42, Lombard-street.
Fuller & Co., 66, Moorgate-street.
Glynn, Sir R. C., & Co., 67, Lombard-st.
Goslings & Sharpe, 19, Fleet-street.
Hanbury, Taylor, & Lloyd, 60, Lombard-street.
Hankey & Co., 7, Fenchurch-street.
Herries, Farquhar, & Co., 16, St. James's-street.
Hill & Sons, 17, West Smithfield.
Hoare, Messrs, 37, Fleet-street.
Hopkinson & Co., 3, Regent-st., Waterloo-place.
Ionian Bank, 6, Great Winchester-st.
Johnston, H. & J., & Co., 15, Bush-lane, Cannon-street.
Jones, Loyd, & Co., 43, Lothbury.
London & County Joint Stock Banking Co., 21, Lombard-street.
London Joint Stock Bank, 5, Princes-st., Bank; 69, Pall Mall.
London & Westminster Bank, 38, Lothbury; St. James's-square; 213 & 214, High Holborn; Wellington-street, Borough; 87, High-street, Whitechapel; 4, Stratford-place.
Lubbock, Sir J. W., Bart., & Co., 11, Mansion-house-street.
Martin, Stone, Martin, & Co., 68, Lombard-street.
Masterman, Peters, & Co., 55, Nicholas-lane.
National Bank of Ireland, 13, Old Broad-street.
National Provincial Bank of England, 112, Bishopsgate-street-within.
North-Western Bank of India, 19, King's Arms-yard, Moorgate-street.
Oriental, 7, Walbrook.
Pocklington & Lacey, 60, W. Smithfield.
Praed, Fane, Praed, Johnstone, & Co., 189, Fleet-street.
Prescott, Grote, & Co., 62, Threadneedle-street.
Price, Sir C., Bart., & Co., 3, King William-street.
Provincial Bank of Ireland, 42, Broad-st.
Puget, Bainbridge, & Co., St. Paul's-churchyard.
Ransom & Co., 1, Pall Mall East.
Robarts, Curtis, & Co., 15, Lombard-st.
Rogers, Olding, & Co., 29, Clement's-la.
Sapte, Banbury, Muspratt, & Co., 77, Lombard-street.
Scott, Sir S., Bart., & Co., 1, Cavendish-square.
Shank, J., 76, West Smithfield.
Smith, Payne, & Smith, 1, Lombard-st.
South Australian Banking Co., 54, Old Broad-street.
Spooner, Attwoods, & Co., 27, Grace-church-street.
Stevenson, Salt, & Sons, 20, Lombard-street.
Stride, J. & W. S., 41, West Smithfield.
Strahan, W. & P., Sir J. D., Bart., Temple-bar-without, 217, Strand.
Tisdall, T. G., 15, West Smithfield.
Twining, R. G., J. A., & R., 215, Strand.
Union Bank of Australia.
Union Bonk of London, 2, Princes-st., Bank; Argyll-place; 4, Pall Mall East.
Williams, Deacon, Labouchere, & Co., 20, Birchin-lane.
Willis, Percival, & Co., 76, Lombard-st.

CITY OFFICERS.

LORD MAYOR.

The Right Hon. Sir J. Duke, M.P. . 1840

SHERIFFS.

T. Q. Finnis; J. E. Goodhart.

UNDER SHERIFFS.

T. France; D. W. Wire.

ALDERMEN.

The following have not passed the Chair.

	Chosen
Farncomb, T., Griffin's-wharf	1840
Musgrove, J., 18, Old Broad-st....	1842
Hunter, W., 10, Finsbury-circus ..	1843
Challis, T., 32, Wilson-street	1843
Sidney, T., M.P., 8, Ludgate-hill ..	1844
Moon, F. G., 20, Threadneedle-st ..	1844
Salomons, D., 1, Shorter's-court ..	1848
Finnis, T. Q., Tower-street.....	1848
Lawrence, W., 30, Bread-street....	1848

The following have passed the Chair.

	Chosen
Hunter, Sir C. S., Bt., 23, Euston-sq.	1804
Thompson, W., M.P., Up. Thames-st.	1821
Key, Sir J., Bart., 3, Abchurch-la..	1823
Laurie, Sir P., Kt., 7, Park-square..	1826
Farebrother, C., 6, Lancaster-place	1826
Copeland, W., M.P., 37, Linc.-inn-fid.	1829
Kelly, T., 17, Paternoster-row	1830
Wilson, S., 24, St. Paul's-churchyd.	1831
Marshall, Sir C., Kt., 43, Russell-sq.	1832
Pirie, Sir J., Bart., Birchin-lane....	1834
Humphrey, J., M.P., Hay's-wharf..	1835
Magnay, Sir W., Bart., College-hill	1838
Gibbs, M., 33, Walbrook	1838
Johnson, J., Milbank	1839
Carroll, Sir G., 34, Cavendish-sq...	1840
Hooper, J. K.	1840

BRITISH AND FOREIGN AMBASSADORS.

Country.	*British Ministers abroad.*	*Secretaries of Legation.*	*Foreign Ambassadors.*	*Secretaries of Legation.*
America....	Hon. R. Pakenham	J. F. Crampton.	G. Bancroft.	J. R. Broad-
Austria	Visc. Ponsonby.	A. C. Magenis.	Baron Koller.	[head.
Bavaria	J. B. Milbanke.	S. H. Sullivan.	Baron de Cetto.	
Belgium....	Ld. H. de Walden.	T. W. Waller.	S. Van de Weyer	C. Drouet.
Brazil.....	Lord Howden.	J. Hudson.	Marq. de Lisboa.	A. de Paiva.
Denmark ..	Rt. Hn. H. W. W. Wynn.	P. Browne.	Ct. de Reventlow.	M. Bielke.
France	Marq. Normanby.	Lord W. Hervey.	M. G. de Beau-	M Montherot
Germn. Con.	Hn. W. Strangways	Hn. F. Molyneux.	[mont	
Greece	Sir E. Lyons, Bt.	P. Griffith.		
Hanseatic T.	G. L. Hodges.		J. Colquhoun.	[mann.
Hanover ..	Hon. J. D. Bligh.	Hn. G. Edgcumbe	Ct. Kielmansegge	C. Klinge-
Mexico	C. Bankhead.	P. W. Doyle.	Don J. M. Mora.	Dn J Murphy
Netherlands	Sir E. Disbrowe.	Hon. H. Elliott.	Ct. Schimmel-	J. L. A Stra-
			penninck.	[tenus.
N. Granada	D. F. O'Leary.		M. M. Mosquera	Dn Rde Alaya
Portugal ..	Sir G. Seymour.	Hn. H. G. Howard	Vis. de Moncorvo	Cv M Ribeiro
Prussia	E. of Westmorland	H. F. Howard.	Chev. Bunsen.	Prin. of Wer-
La Plata ..	H. Southern.	F. L. Ball.	Don M. Moreno.	[theim.
Russia	Lord Bloomfield.	A. Buchanan.	B. de Brunnow.	Ct. de Berg.
Sardinia....	Hn. R. Abercrombie	Hon. R. Bingham	Chev. T. de Revel.	Bar. T. Sola.
Saxony	Hon. F. Forbes.	C. T. Barnard.	Baron de Beust.	M. Sibbern.
Sicilies, Two	Hon. W. Temple.	Lord Napier.	Pr. Castelcicala.	Sig. Conofa-
Spain				[ri.
Sweden	Sir T. Cartwright.	G. R. Gordon.	Baron Rehausen	A. de Jærta.
Switzerland	Lord Cowley.	R. Peel.		
Turkey	Sir S. Canning.	Hn. C. Ashhburn-	Pr. Callimaki.	
		ham.		
Tuscany....	Sir G. B. Hamilton	Hn. P. C. Scarlett.		
Wurtembrg.	Sir A. Malet, Bart.	A. Craven.	Baron de Hugel.	

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Nova Scotia ..	Lt.-Gen. Sir J. Harvey, K.C.B. ..	Hon. J. Howe.
New Brunswick ..	Sir E. W. Head Bart.	G. Botsford.
Pr. Edward's Island	Sir D. Campbell, Bart.	T. H. Haviland.
Newfoundland ..	Sir J. G. le Marchant.	J. Crowdey.
Barbadoes	Colonel Sir W. M. G. Colebrooke ..	J. Walker.
Grenada	Ker B. Hamilton	O. Rowley.
St. Vincent	Sir J. Campbell, Bart.	J. Beresford.
Tobago	Major L. Græme	J. Thornton.
St. Lucia.... ..	C. H. Darling	W. Hanley.
Trinidad	Lord Harris	A. White.
Antigua	J. M. Higginson	T. Lane.
Montserrat.. ..	E. D. Baynes	H. Loving.
Nevis	W. Shortland	T. Slater.
St. Kitts	R. J. Mackintosh	R. M. Rumsey.
Dominica	Lieut.-Col. G. Macdonald	J. Agnew.
Jamaica	Rt. Hon. Sir C. E. Grey	W. G. Stewart.
Heligoland	Capt. J. Hindmarsh, R.N.	
Honduras	Col. Fancourt	G. C. Berkeley.
British Guiana ..	H. Barkley	W. Walker.
Bahamas	G. B. Matthew	C. R. Nesbit.
Bermuda	Capt. C. Elliott, R.N.	R. Kennedy.
Cape of Good Hope	Maj.-Gen. Sir H. Smith	J. Montague.
Ceylon	Viscount Torrington	Sir J. E. Tennant.
Gibraltar	Sir R. W. Gardiner	G. Adderley.
Hong Kong ..	S. G. Bonham	Major W. Caine.
Malta	R. M. O'Ferral	H. Lushington.
Mauritius	Lieut.-Gen. Sir W. M. Gomm, K.C.B.	G. F. Dick.
New South Wales	Sir C. A. Fitzroy	E. D. Thomson.
St. Helena	Maj.-Gen. Sir P. Ross, G.C.M.G., K.C.H.	R. C. Pennell.
Sierra Leone ..	N.W. Macdonald	W. Ferguson.
River Gambia ..	R. G. Macdonel	T. L. Ingram.
Van Diemen's Land	Capt. Sir W. T. Denison, R.E. ..	J. E. Bicheno.
West Australia ..	C. Fitzgerald	A. R. Madden.
South Australia ..	Sir H. E. F. Young	H. M. Mundy.
New Zealand ..	Sir G. Grey	Dr. Sinclair.
Falkland Islands ..	G. Rennie	
Ionian Islands ..	Gen. Lord Seaton, G.C.B.	J. Frazer.

Virgin Island.—E. H. D. Hay.
Labuan.—J. Brooke.

Gold Coast.—W. Winniett.
Natal.—M. West.

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Austria.—3, New-ct., St. Swithin's-lane
Baden.—Consul's-office, 7, Riches-crt.
Bavaria.—11, Bury-crt., St. Mary Axe.
Belgium.—Consul's-office, 3, Copthall-ct.
Brazil.—3, Howford-bldngs., Fenchrh-st.
Denmark.—Consul's-of., 6, Warnford-ct.
Equador Straits.—10, Old Jewry-cham.
France.—Consul's-off., 3, Copthall-bldgs.
Frankfort.—12, Broad-street-bldgs.
Greece.—Consul's-off., 25, Finsbury-circ.
Hanover.—Consul's-office, 6, Circus, Minories.
Hanseatic Towns.—Consul's-office, 76, Cornhill.
Hesse.—106, Fenchurch-street.
La Plata.—27, New Broad-street.
Mecklenburg.—Consul's-off., 9, Billiter-street.
Mexico.—3, Winchester-buildings.
Netherlands.—Consul's-off., 123, Fenchurch-st.
New Granada.—3, Winchester-bldings.
Oldenburg.—Consul's-office, 6, Gt. Winchester-st.
Peru.—64, Old Broad-street.
Portugal.—Consul's-off., 5, Jefferey-sq.
Prussia.—Consul's-office, 106, Fench.-st.
Russia.—Consul's-office, 2, Winchester-buildings.
Sardinia.—Consul's-off., 31, Old Jewry.
Saxony.—76, Cornhill.
Sicilies, the Two.—15, Cambridge-street, Hyde-park.
Spain.—Consul's-office, 37, Old Broad-st.
Sweden and Norway.—14, Halkin-st., Belgrave-square.
Switzerland.—Consul's-office, 24 A, Cateaton-street.
Turkey.—Consulate, 28, Gt. Winchest.-st.
Tuscany.—Consul's-office, 15, Angel-ct.
Venezuela.—Tokenhouse-yard.
Wurtemberg.—106, Fenchurch-st.

COURTS OF LAW.

England.

COURT OF CHANCERY.

Lord High Chan.—Rt. Hon. Lord Cottenham.
Chief Sec.—C. Romilly.
Sec. of Bankrupts.—W. Vizard.
Mast. of Rolls.—Lord Langdale.
Chief Sec.—G. W. Sanders.
Vice-Chan. of England.—Rt. Hon. Sir L. Shadwell.
Vice-Chans.—Right Hon. Sir J. L. Kt. Bruce; Right Hon. Sir J. Wigram.
Ac.-Gen.—W. Russell.

QUEEN'S BENCH.

Lord Chief Justice.—Lord Denman.
Judges.—Sir J. Patteson; Sir J. T. Coleridge; Sir W. Wightman; and Sir W. Erle.

COMMON PLEAS.

Lord Chief Justice.—Right Hon. Sir T. Wilde.
Judges.—Sir T. Coltman; Sir W. H. Maule; Sir C. Cresswell; Sir V. Williams.

EXCHEQUER.

Lord Chief Baron.—Right Hon. Sir F. Pollock.
Barons.—Right Hon. Sir J. Parke, Sir E. H. Anderson; Sir R. M. Rolfe; Sir T. J. Platt.
Cursitor Baron.—G. Bankes.

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Sol.-Gen.—Sir J. Romilly, M.P.

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INSOLVENT DEBTORS' COURT.

Chief Commis.—H. R. Reynolds.
Commissioners.—J. G. Harris; W. J. Law; and C. Phillips.

MARSHALSEA AND PALACE COURTS.

Knight Marshal.—Sir C. M. Lamb, Bt.
Steward of the Court.—W. B. Brent.
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Ireland.

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Lord-Chan.—Rt. Hon. M. Brady.
Sec.—F. W. Brady.
Mast. of Rolls.—Rt. Hon. T. B. Smith.

COURT OF QUEEN'S BENCH.

Lord Chief Just.—Rt. Hon. F. Blackburne.
Judges.—Hon. P. C. Crampton; Right Hon. L. Perrin; Rt. Hon. R. Moore.

COURT OF COMMON PLEAS.

Lord Chief Justice.—Rt. Hon. J. Doherty.
Judges.—R. Torrens, Rt. Hon. N. Ball; J. D. Jackson.

COURT OF EXCHEQUER.

Lord Chief Baron.—Right Hon. D. R. Pigot.
Barons.—R. Pennefather; Rt. Hon. J. Richards; Right Hon. T. Lefroy.

INSOLVENT DEBTORS' COURT.

Commissioners.—R. Farrel, Q.C., and W. H. Curran.
Chief Clerk.—P. Burrows.

BANKRUPTCY COURT.

Commissioners.—J. Magan, Q.C., and Hon. P. Plunket.
Registe.—B. Collins and T. Batley.

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Att.-Gen.—J. M. Monahan.
Sol.-Gen.—J. Hatchell.
Serjeants.—J. Stock, LL.D., M.P.; R. B. Warren, Q.C.; and J. Howley, Q.C.

PUBLIC OFFICES.

Audit Office for Public Accounts, Somerset-house.
Board of Control for East-India affairs, Cannon-row, Westminster.
Board of Trade, Whitehall.
Board of Works, consol. with Commiss. of Woods & Forests and Land Revenue.
Chancellor of Exchequer, 11, Downing-st.
City Solicitor's Office, Guildhall.
Coal Exchange, Lower Thames-street.
Colonial Land and Emigration Board, 15, Park-street.
Colonial Office, Downing-street.
Commissioners of Railways, Whitehall.
Commissioners of Sewers for City of London, Guildhall-yard.
Corn Exchange, Mark-lane.
Council Office, Whitehall.
Custom-house, Lower Thames-street.
Designs Office, 4, Somerset-place.
Duchy of Cornwall Office, Somerset-ho.
Duchy of Lancaster Office, Lancaster-place, Waterloo-bridge.
East-India House, Leadenhall-street.

Education, Commissioners for, Whitehll.
Enrolment Office, Chancery-lane.
Factories', Inspectors' Office, Bd. of Trade
Foreign Office, 15 and 16, Downing-st.
Gazette Office, Cannon-row.
Grand Junction Canal Office, Surrey-st., Strand.
Home Office, Whitehall.
Irish Office, 18, Gt. Queen-st., Westmr.
Lord Chamberlain's Office, Stable-yard.
Lord Chancellor's Office, Quality-court.
Lord Mayor's Court Office, 7, Old Jewry.
Patent Bill Office, 13, Serle-street, Lincoln's-inn.
Post Office, St. Martin's-le-Grand.
School of Design, Somerset-house.
Society for Diffusion of Useful Knowledge, 42, Bedford-square.
State Paper Office, 12, Duke-st., Westmr.
Stock Exchange, Capel-court, Bank.

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Exper. Philosophy.—Rev. R. Walker, M.A., Wadham.
Aldrich's Chemistry.—C. G. B. Daubeny, M.D., F.R.S.
Mineralogy & Geology.—W. Buckland, D.D., F.R.S.

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High Steward.—Lord Lyndhurst, LL.D.
Vice-Chancellor.—Robert Phelps, D.D.
Chemistry. -J. Cumming, M.A., F.R.S.
Mineralogy.—W. H. Miller, M.A.

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Mathematics & Nat. Philosophy.—Rev. J. L. Heaviside, M.A.; G.B. Jerrard, B.A.
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Chemistry.—T. Graham.
Mech. Principles of Engineering. — E. Hodgkinson.
Civ. Engineering.—H. Lewis, A.M.
Geology.—A. C. Ramsey, F.G.S.
Machinery.—B. Woodcroft.

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Treasurer.—Ald. W. Thompson, M.P.

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Geology.—D. T. Ansted, M.A.
Chemistry.—W. A. Miller, M.D., F.R.S., Prof.; J. E. Bowman, Demonstrator.
Manufacturing Art.—E. Cowper.
Mineralogy.—J. Tennant.
Geomet. Drawing.—T. Bradley.

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Nat. Philos.—Rev. C. T. Whitley, M.A.
Chemistry.—J. F. W. Johnston, M.A.

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Founded by William of Wykeham, Bishop of Winton, 1387.
Visitor.—Bishop of Winchester.

ETON.

Founded by Henry VI. in 1441.
Visitor.—The Bishop of Lincoln.

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Founded by Dean Colet, 1510.
Governors.—Worshipful Co. of Mercers.

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Visitor.—Very Rev. The Dean of Manchester.

SHERBORNE.

Founded by King Edward VI., 1550.
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Founded by King Edward VI., 1552.
Head Classical Master.—Rev. E. Rice, D.D.

HERTFORD.

Classical Master.—Rev. N. Keymer.

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Head Master.—H. G. Liddell, M.A.

HARROW.
Founded by John Lyon, 1560.
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Master.—G. I. Allen.

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UNIVERSITY OF GLASGOW, 1451.
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Civ. Eng.—L. D. B. Gordon.
Chemistry.—T. Thomson, M.D.

ABERDEEN, KING'S COLLEGE, 1494.
Chancellor.—Earl of Aberdeen.
Nat. Phil.—D. Thomson, M.A.

MARISCHAL COLLEGE AND UNIVERSITY, 1593.
Chancellor.—Duke of Richmond and Lennox.
Civil & Nat. Hist.—W. MacGillivray, LL.D.
Chemistry.—T. Clark, M.D.

UNIVERSITY OF EDINBURGH, 1582.
Principal.—J. Lee, D.D.
Nat. Philos.—J. D. Forbes.
Chemistry.—W. Gregory, M.D.

Ireland.

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Chem. & Mineralogy.—J. Apjohn, M.D.
Geology.—J. Phillips, F.R.S.
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Civil Eng.—Sir John M'Neil, LL.D.

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Local Secs.—M. Moggridge; Dr. Nicholl.
Meeting for 1849, Birmingham.

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Patron.—Lord Brougham.
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ROYAL INSTITUTION.
Pres.—Duke of Northumberland.
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Patron.—The Queen.
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ROYAL SOCIETY.
Pres.—Marquis of Northampton.
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Foreign Sec.—Lieut.-Col. Sabine.

ROYAL SOCIETY OF LITERATURE.
Pres.—Henry Hallam.
Sec.—Rev. R. Cattermole.

HOLIDAYS KEPT AT PUBLIC OFFICES.

ENGLAND.

At the Bank, the only Holidays in the Dividend Offices are Good Friday and Christmas Day; in the Transfer Offices, besides the above, May 1 and Nov. 1.

East-India House and Exchequer.—Good Friday and Christmas Day.

Custom House and the Public Dock Companies.—Christmas Day and Good Friday, Prince of Wales's Birthday, November 9, and Her Majesty's Birthday, May 24.

Excise and Stamp Offices.—The Holidays are the same as in the Customs, with the addition of Whit Monday, Whit Tuesday, and May 29.

IRELAND.

Banks, Stamp Office, and Custom House.—Good Friday, Christmas Day, and Qu.'s Birthday.

SCOTLAND.

Bank Holidays.—New Year's Day, King Charles I.'s Martyrdom, Queen's Marriage, Good Friday, Queen's Birthday, King Charles II.'s Restoration, Queen's Accession, Queen's Coronation, Gunpowder Plot, Christmas Day.

TRANSFER DAYS, DIVIDENDS, &c.

AT THE BANK OF ENGLAND.

Stock.	*Dividends due.*
Bank Stock	Apr. 5 & Oct. 10.
3 per Cent. Reduced	Apr. 5 & Oct. 10.
3¼ per Cent. Annuities	Apr. 5 & Oct. 5.
5 per Cent. New	Jan. 5 & July 5.
3 per Cent. 1726	Jan. 5 & July 5.
3 per Cent. Consols	Jan. 5 & July 5.
Long Annuities	Apr. 5 & Oct. 10.
Annuities ending 1859	Apr. 5 & Oct. 10.
Annuities ending 1860	Jan. 5 & July 5.

Life Annuities, if transferred between January 5 and April 4, or between July 5 and October 9, payable January 5 and July 5. If transferred between April 5 and July 4, or between October 10 and January 4, payable April 5 and October 10. Transferred at the National Debt Office, Old Jewry.

The Dividends are paid to the public three days after the above dates.

Hours for buying and selling, 10 to 1; transferring, 11 to half-past 2; accepting Stock, 9 to 3; payment of dividends, 9 to 3.

Transfer books closed at One o'clock on Saturdays.

AT THE SOUTH SEA HOUSE.

Stock.	*Dividends due.*
South Sea Stock	Jan. 5 & July 5.
3 per Cent. Old Annuities	Apr. 5 & Oct. 10.
3 per Cent. New Anns.	Jan. 5 & July 5.
3 per Cent. 1751	Jan. 5 & July 5.

Transfer, 11 to half-past 2; receiving dividends, 9 to 2.

AT THE EAST-INDIA HOUSE.

East-India Stock	Jan. 5 & July 5.
India Bonds	Mar. 1 & Sept. 30.

Hours of transfer at the India House, 11 to 3. Dividends paid, 9 to 3.

Tickets for preparing transfer must be given in before 1 o'clock. At the India House, before 2.

Private transfers made at other times than as above, the books not being shut, by paying 2s. 6d. extra.

Expenses of transfer in Bank Stock for £25 and under, 9s.; above that sum 12s. India Stock, £1. 10s. South Sea Stock, if under £100, 9s. 6d.; above that sum, 12s.

Powers of Attorney for the sale or transfer of Stock, to be left at the Bank, &c. for examination, one day before acted upon; if for receiving dividends, they may be presented at the time the first dividend is payable.

Probates of wills, letters of administration, and other proofs of decease, must be left at the Bank, &c. for registration.

No addition of Stock can be made to any account, whether such account be in a single name, or in joint names, in which the decease, either of the individual, or of any one party, if a joint account, has taken place.

Vote at Meeting of Bank Proprietors.—The previous unaltered possession of £500 Bank Stock for six months clear entitles a proprietor to vote.

Vote at the India House.—The clear unaltered possession of £1,000 India Stock entitles to one vote; of £3,000, to two votes; of £6,000 to three votes; and of £10,000 to four votes.

TRADES DIRECTORY.

COAL AND IRON COMPANIES.

Arigna Iron Company (N. S. Price, managing director). 9, Liverpool-street, Bishopsgate.
Banwen Iron Company (S. Pottinger, Harris). 23, Leadenhall-street.
Birtley Iron Company (C. Perkins, manager). 67, Mark-lane, and Scott's-wharf, Bankside.
Blaenavon Iron and Coal Company (J. Booth, secretary). 4, Pancras-lane.
Bowling Iron Company (J. Freeman, agent). 8, St. Swithin's-lane.
British Iron Company (R. Smith, secretary). South Sea-ho., Threadneedle-st.
Butterley Iron Company (C. Kreeft, agent). 9, Billiter-square.
Cameron's Coalbrook Steam Coal Company (A. C. Howden, secretary). 2, Moorgate-street.
Carron Company's Iron Warehouse (H. Stainton, agent). 15, Up. Thames-st.
Chilton Colliery Coal Company (C. Goddard). Ashton's-wharf, Brunswick-wharf, Blackwall.
Fore and Aft Dock Coal Company (S. Mansell). 27, Bermondsey-wall.
Galvanized (Patent) Iron Company (S. Vincent, secretary). 3, Mansion-house-place.
Gaspè Fishery and Coal Mining Company (F. Dyken, sec.) 2, New Broad-st.
Indian Iron and Chrome Ore Company. 10½, King's-arms-yard, Moorgate-st.
Iron Colliery Coal and Coke Company Off. (C. Gilderseve's). Somerset-whf., Bankside.
Leasingthorne Coal Company (J. Claxton). Crescent-road, Mill-bank.
Llangennech Coal Company (C. A. Gray, secretary). 18 and 19, Crosby-hall-chambers. Bishopsgate-st. Without.
Llynvi Iron Company (F. W. Gibbon, secretary). 21, Moorgate-street, City.
London Vulcan Iron Company. St. Ann's-wharf, Earl-street, Blackfriars.
Middleboro' and Witton-park Iron Company (John Boyd, agent). 19, East-India-chambers, Leadenhall-street.
New British Iron Company (R. Smith, secretary). South Sea-house, Threadneedle-street.
Nister Dale Iron Company (F. W. Emerson, clerk). 10, Old Jewry-chambers.
Omoa Iron Office (W. S. Lindsay, agent). 11, Abchurch-lane.
Pembrokeshire Iron and Coal Company (J. F. Neale). 18A, Basinghall-street.
Rhymney Iron Company (T. E. Scudamore, secretary). 7, Laurence Pountney-hill.
Thornley Coal Company (M. H. Chaytor, manager). 42, Lombard-street; 34, Cockspur-st.; Davis's-wharf, Tooley-street; Bridewell-wharf, Blackfriars; York and Augustus wharfs, Regent's-park-basin; 2 Wharf, Regent's-canal-basin; Limehouse and Billingsgate-wharf, Church-street, Greenwich.
Weardale Iron Company. 110, Fenchurch-street, and 41, Steelyard-whf., 26, Upper Thames-street.
Yniscedwyn Anthracite Iron Company (Garden & Macandrew). 27, Queen-street.

COPPER SMELTERS.

Freeman & Co.
Grenfell, P., & Sons. 27, Up. Thames-st.
Mines Royal Company. Golden Heart Wharf, Upper Thames-street.
Sims, Willyams, & Co. Steelyard Wharf, Upper Thames-street.
Schneider, Jno., & Co. 10, New Broad-street Mews.
Vivian & Sons. Paul's Wharf, 25, Upper Thames-street.
Williams, Foster, & Co. 68, Up. Thames-street.
Williams, Crown Copper Company. 68, Upper Thames-street.

DOCK COMPANIES.

Birkenhead Dock Company. 25, Abingdon-street.
Commercial Dock Company (H. K. Smithers, jun., secretary). 105, Fenchurch-street.
East Country Dock (A. Shirreff, sec.) 50, Lombard-st.; Dock, Rotherhithe.
East and West India Dock Company (Geo. Collin, secretary). 6, Billiter-sq.
Grand Surrey Dock and Canal Company (S. Travers, secretary). Rotherhithe, and 2, White Lion-court, Cornhill.
London Dock Company (J. D. Powles, secretary). 1, New Bank-buildings, Lothbury.
St. Katherine Dock Company (Sir J. Hull, K.C.H., secretary). Tower-hill.
Southampton Dock Company (G. Saintsbury, secretary). 19, Bishopsgate-street Within.

DRAUGHTSMEN.

Ambrose, E. Falcon-court, Fleet-street.
Cansdell, W. 134, Blackfriars-road.
Cheffins, C. F. 6, Castle-st., Holborn.
Cooper, J. C. 109, Long-acre.
Culliford, C. J. 22, Southampton-street, Strand.

Dennis, C. 1, Bartlett's-buildings.
Dyke, Thomas. 5, Spring-street, Marylebone.
Eno, H. 46, Goodge-street, Tottenham-court-road.
Gardner, John, & Co. 8, Bride-court, Fleet-street.
George, B. 54, Hatton-garden.
Greathead, T. W. 20, Wilmington-sq.
Groom, R. 44, Paternoster-row.
Hall, E. 4, Bridge-street, Westminster.
Hare, J. 5, Baker-street, Portman-sq.
Howe, C. West-st., Southwark-bridge-road.
Jobbins, J. R. 3, Warwick-ct., Holborn.
Lee, G. L. 376, Strand, and 245, High Holborn.
Lewis, J. 3, Agnes-place, Waterloo-rd.
M'Cabe, J. E. 35, Castle-st., Holborn.
Mackenzie, G. 3, Claremont-row, Islng.
Maclure, Macdonald, & Co. 6, Leicester-square.
Martin & Hood. 8, Great Newport-st.
Mitchim, P. 17, Bedford-street, Bedford-row.
Newton, W., & Son. 66, Chancery-lane.
Packer, T. 1, Bartlett's-buildings.
Prior, W. H. 28, Tonbridge-place, New-road.
Webb, George, & Co. 3, Snow-hill.
Willis, J. 4, Nassau-street, Middlesex-hospital.
Wilme, B. P. 15, Featherstone-bldgs.
Wood, H. 24, Percy-street, Tottenham-court-road.

GUNPOWDER MANUFACTURERS.

Bridges, Sir H. 35, St. Swithin's-lane.
Burton, W. F. 25, Broad-street-bldgs.
Curtis & Harvey. 74, Lombard-st.
Downman, C. P., & Co. 26, Birchin-lane, City.
Hall, J., & Son. 23, Lombard-street.
Pigou & Wilks. 34, Throgmorton-st.
Sharp, J. & T. 8, Birchin-lane, Cornhill.
Slater, W. 332, Wapping.
Watling, A., & Co. 146, Leadenhall-st.

INSTITUTIONS.

Archæological Institute of Gt. Britain and Ireland (Marquis of Northampton, president; Rev. R. S. Maitland, treasurer; A. Way, and C. Newton, hon. secretaries; T. H. Turner, ass. secretary). 12, Haymarket.
Art-Union of London (president, Duke of Cambridge; hon. secretaries, G. Godwin, F.R.S., and L. Pocock, F.S.A.; T. S. Watson, ass. secretary). 4, Trafalgar-square.
Artists' General Benevolent Institution (W. Roper, secretary). 32, Sackville-street.
British Archæological Association (T. C. Croker and C. R. Smith, secretaries). 4, York-street, Covent-garden.
British Artists' Society (E. Hassell, secretary). 6½, Suffolk-street, Pall-mall.
British Association for the Advancement of Science (J. Taylor, F.R.S., general treasurer). 2, Duke-street, Adelphi.
Electric Society of London (C. E. Jenkins, K.M., director). 11, Great Prescot-st., Goodman's-fields.
Institution of Civil Engineers. 25, Great George-street, Westminster.
Geological Society. Somerset-house, Strand.
London Architectural Society (F. Johnstone, secretary). 29, Somerset-street, Portman-square.
Poplar Literary and Scientific Institution (T. E. Bowkett, secretary). 67½, Poplar High-street.
Royal Astronomical Society (Capt. W. H. Smyth, president; Rev. R. Sheepshank and W. Rutherford secretaries; Sir J. W. Herschel, foreign secretary; J. W., ass. secretary; G. Bishop, treasurer). Somerset-house.
Royal Geographical Society (Lord Colchester, president; Colonel Jackson, secretary; Rev. G. C. Renouard, for. secretary; J. Shillinglaw, ass. secretary and librarian). 3, Waterloo-place.
Royal Institute of British Architects (Earl de Grey, president; Geo. Bailey and J. J. Scoles, hon. secretaries; T. L. Donaldson, for. secretary). 16, Grosvenor-street.
Royal Polytechnic Institution (R. I. Longbottom, secretary). 309, Regent-street, and 5, Cavendish-square.
United Service Institution (H. Downes, R.N., hon. director). Whitehall-yard.
Westminster Literary and Scientific and Mechanics' Institution (H.R.H. Prince Albert, patron; the Right Hon. C. S. Lefevre, Speaker of the House of Commons, president; W. H. J. Traice, secretary). 6 & 7, Great Smith-street, Westminster.
Statistical Society (Richard King, M.D., secretary). 12, St. James's-square.

IRON AND STEEL MERCHANTS.

Bailey, Pegg, & Co. 81, Bankside, and Gun-wharf, 64, Wapping-wall.
Balls, T. 39, Old Broad-street.
Barlow, J. 32, Bucklersbury.
Baylie, E., & Co. 39, Rosoman-street, Clerkenwell.
Bennetts & Files. 5, Railway-place, Fenchurch-street.
Bentley, N. 4, Fen-court, City.
Bird, W. 37, Basinghall-street.
Bird, W., & Co. 5, Martin's-lane, Cannon-street.
Bolckow & Vaughan. 19, East-India-chambers.
Brown, J. Dowgate Iron-whf., Thames-street.

Bunn, E. T., & Son. 9, St. Michael's-alley, Cornhill.
Cohen, H. 45, Cowcross-street, and 50, Great Saffron-hill.
Crawshay, W. George-yd.-whf., Thames-street.
Daniels & Payne. 29, Upper Thames-street.
Dimmack & Co. St. Peter's-chambers, Cornhill.
Dowson, J. E. 69, Welbeck-street, and 5, Seymour-place, Bryanston-square.
Ebbw Vale Company. Dowgate-dock, Upper Thames-street.
Farmer & Gorbell. 92 & 93, St. John-st.
Finch, J. & J. 11, John-st., Adelphi.
Firmstone, J. P. 9, Warnford-court.
Ford, F. 2, Crooked-lane, City.
Freeman, J. 8, St. Swithin's-lane.
Gandell, J. 11, Clement's-lane.
Garden & Mackendrew. 27, Queen-street, City.
Gilmour, D. St. Ann's-wharf, Earl-st., Blackfriars.
Glasscott, F. T. 20, Brownlow-street, Drury-lane.
Goddard, L. 220, Wapping.
Graham, W., & Sons. Trig-lane, Upper Thames-street.
Grazebrook, J. W. 10 whf., City-rd. bas.
Guest, Sir J., & Co. 42, Lothbury.
Hall, H. 83, Abchurch-lane, City.
Handasyde, W., & Co. 57, Cannon-st., City, and Emerson-street, Bankside.
Harratt, C. Colebrook-dl. whfs., Dowgt.
Hawks & Crawshay. 23, Upper Thames-street,
Heath, J. M. 2, Winchester-buildings.
Hitchcock, G. C. 2, Crosby-square, and Lloyd's.
Hogarth, J. Hartley's-whf., Horsleydn.
Hood, T. & C. 18, Earl-street, Blckfriars.
Hoole & Lockyer. 21, St. James's-walk, and 1, Suffolk-st., Clerkenwell.
Johnson, Cammell, and Co. 19, Great George-street, Westminster.
Jones, G. 27, Old Fish-street.
Jones, J. 6, Bankside, Southwark, and Iron Bridge-wharf.
Kelly, M. 30, Bankside.
Kennard, R. W., & Co. 67, Upper Thames-street.
Kipling, J. & A. 22, Dowgate-hill.
Leadbetter & Moore. 5, Railway-place.
Liney, J. 1, Charles-street East, Hampstead-road.
Linley, T. 4, Carter-st., Walworth-rd.
London Vulcan Iron Works, St. Ann's-wharf, Blackfriars.
Malins & Rawlinsons. 3, Mansion-house-place, and Millwall, Poplar.
Mann, A. 28, Gloucester-terrace, Vauxhall-bridge-road.
Manuel, E. 80, Cowcross-street.
Mathews, W. B. 9, Crooked-lane, and 28, Martin's-lane, City
Morewood & Rogers (galvanized). 9, Steel-yard, 86, Upper Thames-street.
Mortimer, H. H., & Co. 10 and 25, Great Bush-lane.
Moser, Son, & Co. 165, Borough High-street.
Pfeil, A. L. & Co. 5 & 6, Broad-street, Bloomsbury.
Pickering, T. 44, Narrow-st., Limeho.
Plumley, P. 42, New Park-st., Borough, and 5, Bankside.
Porley, A. G. 23, Billiter-street.
Porter, J. Bridge-street, Southwark.
Preller, C. A. 14, Eastcheap.
Reid, A. 14, Fish-street-hill.
Richards, T. S., and Co. 117 & 118, Bishopsgate Within, and at Birmingham.
Rodman, S. 10, Vauxhall-bridge-road.
Russell, J., & Co. 69, Up. Thames-st.
Sharpe, R. 7, Old Jewry.
Smart, C. Phœnix-foundry, Coldbath-fields, and 369, Oxford-street.
Smith, J. 29, Broad-street, Lambeth.
Stainton, H. Carron Company, 15, Up. Thames-street.
Starbuck, E. F. 2, Walbrook.
Starling, W. D. 13, Change-alley.
Stephenson, C., & Co. (hoop). 61, Gracechurch-street.
Stunt, G. 11, Holland-st., Blackfriars-rd.
Swift, A. H. 21, Crosby-hall-chambers.
Thompson & Co. Dyers'-hall-wharf, Upper Thames-street.
Tiddeman & Co. Purfleet-wharf, Earl-street, Blackfriars.
Tillett, G. 67, Hatton-garden.
Treggon & Co. 22, Jewin-street, and 57, Gracechurch-street.
Tyler, Hayward, & Co. 85, Upper Whitecross-street.
Tyrrell, R. Deptford-pier.
Walker, G. 5, Pinners'-hall, Great Winchester-street.
Walker, J. 52, Alfred-street, City-road.
Walker & Holland. 121, Leadenhall-street, and Grange-road, Bermondsey.
Walmsley & Co. 3, Upper Thames-st.
White, Lynch, & Co. 66, Bankside.
Wilkie, G. 9, Steel-yard, Up. Thames-st.
Williams, W. 10, Upper Thames-street.
Wilson, W. G. St. Ann's-wharf, Earl-street, Blackfriars.
Winter & Rich. 1, Bank-end, Park-street, and 7 & 8, Bankside.
Woolcott, J. 6, Great Winchester-street.
Wright, E. 61, Wapping High-street.
Wyatt, J. 2, Weymouth-place, New Kent-road.

LIBRARIES.

Antiquarian Society. Somerset-house.
Beaumont Philosophical Instit. Beaumont-square.
Botanical Society. 20, Bedford-street.
British Museum. Montague-place.
Cadogan Institution. Sloane-street.

Charterhouse. Charterhouse-square.
Chelsea Hospital.
City Library. Guildhall.
Church Missionary College. 12, Barnsbury-place.
City of London Inst. 165, Aldersgate-st.
Clockmakers' Co. King's-head, Poultry.
College of Advocates. Doctors'-coms.
College of Civil Engineers, Putney.
College of Physicians. 13, Pall-mall East.
College of Surgeons. 40, Lincoln's-inn-fields.
Congregational Library. 4, Blomfield-st.
Crosby Hall Lit. and Scien. Inst. 32, Bishopsgate Within.
Dutch Church. Austinfriars (MSS.).
Eastern Lit. and Scien. Inst. Commercial-road.
Eastern Lit. and Scien. Inst. 88, Hackney-road.
East-India House, Leadenhall-street.
Geological Society. Somerset-house.
Gray's-inn. South-square, Gray's-inn.
Greenwich Hospital. Greenwich.
Greenwich Institution. Greenwich.
Guy's Hospital. St. Thomas's-st., Boro'.
Hammersmith Instit. Hammersmith.
Hebrew College. Duke's-place, Aldgate.
Herald's Coll. Bennett's-hill, Doctors'-commons.
Highbury College. Highbury.
Homerton College. Homerton.
House of Lords. Westminster.
House of Commons. Westminster.
Incorporated Law Society. 106, Chancery-lane.
Inner Temple. 3, Tanfield-ct., Temple.
Institution of Civil Engineers. 25, Great George-street, Westminster.
Islington Lit. and Sci. Inst. Wellington-street, Upper-street.
King's College. Somerset-house.
Lambeth Palace. Lambeth.
Lincoln's Inn New Hall. Lincoln's-inn.
Linnæan Society. 32, Soho-square.
London Library. 12, St. James's-sq.
London Institution. Finsbury-circus.
London Mechanics' Inst. 29, Southampton-buildings.
Marylebone Institution. 17, Edwards-street, Portman-square.
Mathematical Soc. Church-st., Spitfields.
Medical Society. 3, Bolt-court, Fleet-st.
Merchant Tailors' School. 6, Suffolk-ln.
Middle Temple. Garden-court, Temple.
Poplar Institution. East-India-road.
Royal Academy of Arts. Trafalgar-sq.
Royal Agricultural Soc. 12, Hanover-sq.
Royal Asiatic Society. 14, Grafton-st.
Royal Astronomical Soc. Somerset-ho.
Royal Geographical Soc. 3, Waterloo-pl.
Royal Institute of British Architects. 16, Grosvenor-street.
Royal Institution. 21, Albemarle-street.
Royal Observatory. Greenwich.
Royal Polytechnic Asso. 5, Cavendish sq.
Royal Kensington Lit. and Sci. Inst. Kensington.
Royal Medical Society. 83, Berners-st.
Royal Society. Somerset-house.
Royal Soc. of Literature. 4, St. Martin's-pl.
Russell Institution. 55, Great Coram-st.
St. Bartholomew's Hospital. Smithfield.
St. Martin's. 42, Castle-st., Leicester-sq.
St. Paul's. St. Paul's Cathedral.
Soane Museum. 13, Lincoln's-inn-fields.
Society of Arts. 19, John-street, Adelphi.
Southwark Lit. Inst. Portland-place, Borough-road.
Statistical Society. 11, Regent-street.
Stepney College. Stepney.
United Service Inst. Mld. Scotland-yd.
University College. Gower-street.
Veterinary Coll. College-st., Camden-tn.
Welsh School. Gray's-inn-road.
Western Lit. Inst. 47, Leicester-square.
Westminster. Westminster-abbey.
Westminster Lit and Sci. Inst. 6, Great Smith-street.
Woolwich Institution. Woolwich.
Zoological Society. 57, Pall-mall.

MECHANICAL ENGINEERS.

Barlow & Co. 32, Bucklersbury.
Bennett, J. 107, Kingsland-road.
Bissell, Mrs. A. 106, Up. East Smithfld.
Blyth, J. & A. 9, Fore-street, Limeho.
Botten, C. 23, Farringdon-street.
Butler, 4, Oxford-street.
Chicken & Stewart. 3, Russell-street, Blackwall.
Christy & Co. Rotherhithe-street.
Clark & Co. 238, Wapping.
Collinge & Co. 64, Bridge-rd., Lambeth.
Cottam & Hallam. 2, Winsley-street; 76, Oxford-street.
Deeley, G. East Buckle-st., Whitechapl.
Fox & Co. 8, New-street, Spring-gards.
Frasi, G. 158, Goswell-street.
German & Co. Bow-common.
Grissell, H. & M. D. 1, Eagle-wharf, Hoxton.
Hall, J. & E. 23, Lombard-street.
Hodge, S. Oak-lane, Limehouse.
Horn, J. 14, Whitechapel High-street.
Massie, A. Brewhouse-lane.
Medhurst, T. 1, Denmark-street, Soho.
Morton, R. 240, Wapping.
Neilson, W., & Co. 15, Wharf-road, City-road.
Pontifex & Co. Shoe-lane.
Pope, W., & Son. 80 and 81, Edgware-road, Marylebone.
Ramsden, R. 100, Kingsland-road.
Ransome & Co. 2, Upper Charles-st., Westminster.
Rennie, G. & Sir J. 6, Holland-street, Blackfriars.
Rich, C. 10, Palace-row, New-road.
Robinson, C.; & Son. Pimlico-road.
Samuda, Brothers. Orchard-pl., Blackw.
Shears, J., & Sons. 27, Bankside.

Simpson & Co. Belgrave-rd., Pimlico.
Telfer, A. 75, Market-st., Edgware-rd.
Thompson, G., & Sons. 5 Ecclestonstreet East.
Worssam, S. 11, New Manor-st. Chelsea.
Yates, W. T. 1, John-st., Cambridge-hth.

METAL BROKERS.

Anichini, P., sen. 21, Fenchurch-street.
Cotton, Fry, & Co. 1, Riches-court, Lime-street.
Daniels, N. 50, Threadneedle-street.
French & Smith. 14, St. Benet's-place.
Frisby, H. R., & Co. 58, Old-Broad-st.
James & Shakespeare. 10, Austinfriars.
Kirkmann, Brown, & Co. 2, St. Dunstan's-hill.
Moate, C. R. 66, Old Broad-st., City.
Moser, J. L. Baltic Coffee-house.
Protheroe, J., jun. 1, St. Michael's-alley.
Richards, J. 12, George-yd., Lombard-street.
Short, W. 1, Newman's-court, Cornhill.
Swann, W. 14, Pinners'-hall, Old Broadstreet.
Von Dadelszen, G. M. 27, Mincing-la.
Whitcomb and Barton. 75, Old Broadstreet, City.

METAL WAREHOUSES.

Barrett J. 60, Shoe-lane.
Bateman, B. 9, St. Mildred's-court, Poultry.
Bird, W. 37, Basinghall-street.
Cohen, H. 5, Windsor-st., Bishopsgate.
Dace, W. 13, Jerusalem-pas., Clerknwl.
Farwig, W. 12, Bridge-house-pl., Boro'.
Foster, D. G. 23 & 24, St. John's-sq.
Gabain & Co. 4, White Lion-court, Cornhill.
Glascott, T. T. 20, Brownlow-street.
Hedgcock, J. F. 63, King-street, Soho.
Hoole & Lockyer. 21, St. James's-walk, Clerkenwell, and 1, Suffolk-street.
Hughes, M. 107, Shoe-lane, Fleet-st.
Jackson, W. 28, Wilson-st., Crown-st.
Read, J. (*gas*). 30, Brownlow-street, Long-acre.
Stanton, Brs. (*tube*). 73, Shoe-lane.
Twells & Podmore. 2, Brownlow-street.
Walker, E., & Son. 55, Red Lion-street, Clerkenwell.
Young, Dawson, & Co. 5, George-yard, Lombard-st., and Emmett-st., Poplar.

MINERALOGISTS.

Heuland, H. 31, Red Lion-square.
Rogers, H. 9, Bell-yd., and 64, Carey-st.
Tennant, J. 149, Strand.

MINING COMPANIES.

Alten Mining Association (Edward J. Cole, secretary). Winchester-house, 52, Old Broad-street.
Alfred Consols Mining Company (H. Thomas, secretary). 8, George-yard, Lombard-street.
Anglo-Mexican Mining Association. 5, Broad-street-buildings.
Anglo-Mexican Mint Company (G. B. Lonsdale, sec.) 5, Broad-street-bldgs.
Antimony and Silver Lead Mining and Smelting Company (T. Bartlett, manager). 58, Lombard-street.
Asturian Mining Company (K. Mackenzie, secretary). 9, Austinfriars.
Australian Mining Company. 1, Adelaide-place, London-bridge.
Bolanos Mining Company (John Head, secretary). 2, Duke-street, Adelphi.
Camborne Consols Mining Company (H. L. I. Von Uster, sec.) 29, Poultry.
Carn Brea Mines Office (J. M'Donnell, sec.) 35, Broad-street-buildings, City.
Carwinnnig Hill Mining Office (J. A. Tulins, secretary). Lombard-street-chambers, 33, Clement's-lane.
Copiapo Mining Company (F. Grellet, secretary). 26, Austinfriars.
Copper Mining Company (E. Younger, secretary). 5, Warnford-court, Throgmorton-street.
Copper Mining Office (T. Curry). 3, Bond-court, Walbrook.
Cornwall New Mining Company (G. Lockwood, sec.) 17, Essex-st., Strand.
Cubert Silver Lead Mining Company (H. Thomas, secretary). 8, George-yard, Lombard-street.
Cwm-Ystwith Mines Company (J. Mac Donnell, manager). 35, Broad-street-buildings.
Derwent Mines Company. 9, Austinfrs.
Derwent Mines Company (B. O'Connor, secretary). 34, Dowgate-hill.
Devonshire Great Consolidated Copper Mining Company (A. Allen, secretary). 16 & 17, Barge-yard-chambers, Bucklersbury.
Gaspè Fishery and Coal Mining Company (F. Dyken, secretary). 2, New Broad-street, City.
General Mining Association (J. B. Foord, secretary). 52, Old Broadstreet, City.
General Mining Offices (W. H. Smith & W. Coates, secs.) 1, Copthall-chmbs.
German Mining Company (T. Hacket, secretary). 26, Birchin-lane.
Great Polgooth Mining Office (T. A. Corlett, sec.) 38, New Broad-street.
Guadalcanal Silver Mining Association, 34, Broad-street-buildings.
Halkin Mining Company (J. Brand, sec.) 23, King-street, St. James's.
Hibernian Mining Company. 6, Austinfriars.
Holmbush Copper Mining Company (H. Thomas, secretary). 8, George-yard, Lombard-street.

Holyford Copper Mining Company (J. W. Buckland, jun., secretary). 34, Great Winchester-street.
Imperial Brazilian Mining Association. Winchester-ho., Old Broad-st., City.
Keswick Mining Company (W. Brown, secretary). 8, Walbrook.
Kilbricken Mining Company (J. Brund, sec.) 22, King-street, St. James's.
Kinzigthal Mining Association (G. C. Capper, secretary). 1, Adelaide-place, London-bridge.
Minas Geraes Mining Company (G. D. Keogh, sec.) 9, Tokenhouse-yard.
Mines Royal Copper Company (B. J. Spedding, secretary). Golden Hart-wharf, Dowgate, Up. Thames-street.
National Brazilian Mining Association (Mocaúbas & Cocles). 26, Throgmorton-street.
Penycefn and Lleteuhen Silver Lead Mining Company (H. L. T. Von Uster, manager). 29, Poultry.
Real del Monte Mining Company (J. Phillips, sec.) 2, Duke-street, Adelphi.
Royal Mines of Cobre Association. 26, Austinfriars.
Royal Santiago Mining Company. 28, Broad-street-buildings.
St. John del Rey Mining Company (Wm. Routh, sec.) 8, Tokenhouse-yd.
Treleigh Consolidated Copper Mines. 57, Old Broad-street, City.
United Mexican Mining Office (J. Mather, sec.) 8, Great Winchester-st.
Venton Gimpe Mining Company (J. J. Iselin, hon. sec.) 4, Austinfriars.
Wellington Mining Company (H. Thomas, sec.) 8, George-yd., Lombard-st.
West Wheal Jewel Mining Association. 57, Old Broad-street, City.
Wheal Jane Mining Company (H. Thomas, sec.) 8, George-yd., Lombard-st.
Wheal Lawrence Copper & Lead Mining Company (W. Winterbotham, sec.) 3, Winchester-buildings.
Wheal Sarah Mining Company (H. Thomas, sec.) 8, George-yd., Lombard-st.
Wheal Tremayne Mining Company (H. Thomas, secretary). 8, George-yard, Lombard-street.

MUSEUMS.

Antiquarian Society. Somerset-house.
Armourers' Hall. 81, Coleman-street.
Artillery Company. City-road.
Bank of England. Threadneedle-street.
Botanical Society. 20, Bedford-street, Covent-garden.
British Museum. Great Russell-street.
City Museum. Guildhall.
East-India Museum. East-India-house, Leadenhall-street.
Economic Geology. Craig's-court.
Entomological Society. 71, Old Bond-st.
Geological Society. Somerset-house.
Guy's Hospital. St. Thomas's-street, Borough.
Institution of Civil Engineers. 25, Great George-street, Westminster.
King's College. Somerset-house.
Linnæan Society. 32, Soho-square.
London Hospital. Whitechapel-road.
London Institution. Finsbury-circus.
London Mechanics' Institution. 39, Southampton-buildings.
Missionary Museum. 8, Bloomfield-st., Finsbury.
Ordnance Office. 96, Pall-mall.
Royal Asiatic Society. 14, Grafton-st.
Royal Botanical Society of London. Inner-circle, Regent's-park.
Royal College of Surgeons. 40, Lincoln's-inn-fields.
Royal Institute of British Architects. 16, Grosvenor-street.
Royal Institution. 21, Albemarle-street.
Royal Society. Somerset-house.
St. Bartholomew's Hospital. West Smithfield.
St. George's Hospital. Hyde-park-crn.
Sappers' Museum. Woolwich.
Sault's Museum. 15, Aldersgate-street.
Soane Museum (Geo. Bailey, curator). 13, Lincoln's-inn-fields.
Society of Arts. 19, John-st., Adelphi.
Somerset-house. Navy Department.
Tower of London.
Trinity-house. Tower-hill.
University College. Gower-street.
United Service. Whitehall-yard.
Veterinary College. College-st., Camden-town.
Woolwich Repository. Woolwich.
Zoological Society's Museum. Regent's-park.

TIN MERCHANTS.

Bolitho, T. & W. 28, Fenchurch-street.
Budd, J. & E. L. Paul's-wharf, 25, Up. Thames-street.
Crown, T. 187, Union-street, Borough.
Danbuz, L. C. & W. 9, New Broad-st., City.
Dennis, Brs., & Co. 2, Whitehart-court, Lombard-street.
Hore, J. & H. 13, Copthall-court.
Kebbel & Co. Allhallow's-wharf, Upper Thames-street.
Mathews, W. B. 9, Crooked-lane, and 28, Martin's-lane.
Walker, G. 5, Pinners'-hall, Gt. Winchester-street.
Williams, Harvey, & Co. 68, Up. Thames-street.

MISCELLANEOUS COMPANIES.

Australian Agricultural Company (G. Engstrom, secretary). 12, King's Arms-yard.
Australian Trust Company. 48, Moorgate-street.

British Agricultural Company (J. Robinson). Northumberland-al., Fenchurch-street.
British American Land Company (T. R. Exham). 35½, New Broad-street, City.
British West-India Company (J. Innes). 61, Moorgate-street.
Canada Company (J. Perry). 13, St. Helen's-place.
Coal Factors' Committee (G. B. Robinson). Coal Exchange.
Compressed Air Engine Company. 88, St. James's-street.
Deal Pier Company (H. Jackson). 15, St. Helen's-place.
Desiccating Company Patent (A. Jennings). 28, New Broad-street.
Dhobah Company (R. Gardner). 46, Lime-street.
Eastland Company (Thomas Cope). 25, Birchin-lane.
Electric Printing Telegraph Office (J. Brett). 29, Parliament-street.
Electric Telegraph Company (W. H. Hatcher). 54, Moorgate-street.
Equivalent Company (T. G. Smith). 7, Dowgate-hill.
Fire Protective & General Building Improvement Company (W. F. Bray). 9, Lincoln's-inn-fields.
General Wood-cutting Company (J. M. Douglas). Belvedere-road, Lmbth.
Gutta Percha Company (E. Granville). 11, East-India-chambers.
Hudson's Bay Company (A. Barclay). 4, Fenchurch-street.
Hungerford Market Company (A. L. Leith). 9, Villiers-street, Strand.
Irish Land Investment Company (R. Taylor & Co.) 26, Birchin-lane.
Irish Waste Land Improvement Society (F. Fry). 5, St. Mildred's-court.
London Sewage Company (A. Martin). 4, New London-street.
Lough Corrib Commission (J. Barwise). 18, Austinfriars.
Lough Neagh Commission (J. Barwise). 18, Austinfriars.
Metrop. Buildings Office. 6, Adelphi-tr.
Mexican Company (J. M. Manda). 32, Great Winchester-street.
Mexican & South American Company (H. W. Schneider). 19, New Broad-street-mews.
New Brunswick & Nova Scotia Land Company. 5, Copthall-court.
New England Company (J. Fuller). 9, Great St. Helen's.
New London Corn Exchange Company (W. W. Wren). Mark-lane.
New Zealand Company (T. C. Harrington). 9, Broad-street-buildings.
Norwich Union Reversionary Interest Company (H. Norris). 28, Lincoln's-inn-fields.
Old Corn Market Company (T. Levick). Mark-lane.
Patent Oropholithe Company (P. F. Page & Son). 14, King's-rd., Bedford-row.
Prosser's Patent Railway Guide Wheel Company (G. Hadley). 36, New Broad-street.
River Dee Company (B. Lyon). 9, Mansionhouse-street.
River Fergus Drainage & Embankment (J. Barwise). 18, Austinfriars.
Road & Street Cleansing Company (J. Whitworth & Co.) Millbank-street, Westminster.
Russia Company (T. Cope). 25, Birchin-lane.
Shetland Fishery Company (A. Anderson). 15, St. Mary-axe.
South Australian Company (D. M'Laren). 4, New Broad-street, City.
South Sea Company (C. F. Gibson). South Sea-house, Threadneedle-st.
Thames Tunnel Company (J. B. Blundell). 5, Tunnel-road; and Works, 332, Rotherhithe-street.
Tidal Wheel Company, Patent (F. Bennett). 1, Walbrook-bldgs., Walbrook.
Tirhoot Company (W. C. Laurie). 6, Gt. Winchester-street, City.
Union Wine Company (G. Bishop). 32, Great St. Helen's.
Universal Salvage Company. 12, Old Jewry-ch.
Van Diemen's Land Company (G. H. Howell). 6, Gt. Winchester-st., City
Western Australian Land Company (B. Roller). 32, Old Broad-street, City.

MINE BROKERS.

Bawden, J. Bank-chambers.
Herron, J. 33, Clement's-la., Lomb.-st.
Lane, J. 90, Old Broad-street.
Rye, H, B. 77, Old Broad-street.
Stride, J. 27, Spring-gardens.
Thomas, R. 8, George-yd., Lombard-st.
Thomas, H. 8, George-yd., Lombard-st.
Thomas, T.P. 3, George-yd., Lombard-st.
Tredinneck, R. 3, King's-ct. Lombard-st.
Trenery, W. jun. St. Michael's-al. Cornhl.
Watson & Cuell. 1, St. Michael's-al. Crnh.

INSURANCE COMPANIES.

F.—*Fire Insurance.* L.—*Life Insurance.* A.—*Annuity.* M.—*Marine.*

TITLE.	Objects.	Founded	Offices.	Secretary.
ABERDEEN	F. A. & L.	1825	89, Union-street, Aberdeen	J. Watson.
——— (London Board)	L. & L.	1843	36, Essex-street, Strand	Clark & Davidson.
ABERDEEN SEA	M.	1839	Marischal-street, Aberdeen	A. Mathew, Man.
AGRICULTURIST	C.	1845	8, Chatham-place	J. E. Window.
ALBION	L.	1805	New Bridge-street	Edwin Charlton.
ALFRED	L.	1839	7, Lothbury	J. W. Hampton.
ALLIANCE	L. & F.	1824	Bartholomew-lane	Andrew Hamilton.
ALLIANCE	M.	1824	Capel Court	R. J. Shepard.
AMICABLE	L.	1706	Serjeant's-Inn, Fleet-street	Thomas Galloway.
ANCHOR	L. A. & L.	1842	30, Sackville-street, Piccadilly	J. Dalby, Man.
ARCHITECTS, BUILDERS, AND GENERAL	L. F. & A.	1847	69, Lombard-street	John Roldiah.
ARGUS	L.	1833	39, Throgmorton-street	E. Bates, Res. Dir.
ASYLUM	L.	1834	72, Cornhill	G. Farren, Res. Dir.
ATLAS	F. & L.	1808	92, Cheapside	Henry Desborough.
AUSTRALASIAN, COLONIAL, AND GENERAL	L. S. & A.	1839	1, Leadenhall-street	E. Ryley.
BIRMINGHAM	F.	1805	26 and 27, Union-street, Birmingham	William Suckling.
BIRMINGHAM (District)	F.	1834	61, New-street, Birmingham	Henry Lowe.
BON ACCORD	L. F. & G.	1845	18, King-street, Aberdeen	A. Masson.
BRIGHTON, SUSSEX MUTUAL	L. E. A. & S.	1846	47, East-street, Brighton	Rev. Robert Winter.
BRITANNIA	L.	1837	1, Princes-street, Bank	P. Morris, Res. Man.
BRITISH COMMERCIAL	L.	1830	38, Cornhill	E. Ferrile, Man. Dir.
BRITISH EMPIRE MUTUAL	L. & F.	1846	37, New Bridge-street, Blackfriars	W. S. Glover.
BRITISH GUARANTEE	F.	1845	127, Princes-street, Edinburgh	Ralph Erskine Scott.
——— (London Board)	F.	1846	9, Waterloo-place, Pall Mall	R. S. Strickland.
BRITISH MUTUAL	L.	1844	17, New Bridge-street, Blackfriars	C. J. Thicke.
CALEDONIAN	L. & F.	1805	19, George-street, Edinburgh	John Moinet.
——— (London Office)	L.	1833	27, Moorgate-street	Edward F. Healy, Man.
CATHOLIC	L.	1846	8, New Coventry-street	J. Norris.
CHRISTIAN MUTUAL PROVIDENT	L. A. & E.	1846	11, Chatham-place, Blackfriars	Charles Burls, Jun.
CHURCH OF ENGLAND	L. & F.	1840	Lothbury	William Emmens.
CITY OF GLASGOW	L.	1838	40, St. Vincent-place, Glasgow	D. Walkinshaw, Man.

City of Glasgow (London Board)	L.	1838	120, Pall Mall	Hugh Bremner.
City of Glasgow Annual Endowment ..	A. to Wlds.	1840	54, St. Vincent-place, Glasgow	S. Pollock.
City of London	L. & A.	1845	2, Royal Exchange-buildings	E. F. Leeks.
Clerical, Medical, and General	L.	1824	99, Great Russell-street, Bloomsbury ..	G. H. Pinckard.
Clergy Mutual	L. E. & A.	1829	41, Parliament-street	Rev. John Hodgson.
Coal Trade Mutual	Cargo & M.	1813	Market-place, South Shields	Thomas Adams.
Colonial	L.	1846	1, George-street, Edinburgh	Henry Jones Williams.
——— (London Board)	L.	1846	4A, Lothbury	John G. Auld.
Commercial and General	L. E. & L.	1841	112, Cheapside	James Daniell.
Consolidated Investment and Assurance	I. & A.	1846	45, Cheapside	C. Gibson.
County	F.	1807	50, Regent-street	Henry Beaumont.
Crown	L.	1825	33, New Bridge-street, Blackfriars ..	T. G. Conyers.
Defender	F. & L.	1847	34, New Bridge-street, Blackfriars ..	John Kelday, Man. Dir.
Dundee	M.	1849	Exchange-street, Dundee	John Lindsay.
Dundee Sea Marine	M.	1821	Cowgate, Dundee	A. Crighton, Mem.
Eagle and Protector	L.	1807	3, Crescent, New Bridge-street, Blackfriars	Charles Jellicoe.
East of Scotland	L. A. & R.	1845	1, Bank-street, Dundee	Eben. E. Scott.
Economic	L.	1823	6, New Bridge-street, Blackfriars ..	A. Macdonald.
Edinburgh	L.	1823	22, George-street, Edinburgh	William Dickson.
——— (London Board)	L.	1823	11, King William-street, City	C. Staniforth, Res. Dir.
Engineers, Mas. and Universal	L. & A.	1848	345, Strand	Frederick Laurence.
English and Scottish Law	L. & L.	1839	12, Waterloo-place	J. Hill Williams.
English Widows' Fund	L. A. & E.	1847	67, Fleet-street	T. Robinson, Res. Man.
Equity and Law	L.	1844	Lincoln's-Inn-fields	J. J. Sylvester, F.R.S.
Equitable	L. & S.	1762	Bridge-street, Blackfriars	A. Morgan, F.R.S.
Equitable	R. & P.	1835	10, Lancaster-place, Strand	John Clayton.
Essex Economic	F.	1824	High-street, Chelmsford	John K. Leake.
Essex and Suffolk Equitable	F.	1802	Colchester	F. P. Keeling.
Etonian and General	L. & E.	1847	16, Hanover-street, Hanover-square ..	W. P. Pickering.
European	L.	1819	10, Chatham-place, Blackfriars	Charles Saunderson.
Experience	L.	1843	15, George-street, Edinburgh	Alexander Robertson.
——— (London Board)	L.	1845	58, King William-street, City	T. Y. Wardrop.
Family Endowment	E. L. & A.	1835	12, Chatham-place, Blackfriars	John Cazenove.
Farmers and Graziers'	M. Cattle	1844	Strand	Benjamin Coveney.
Forfarshire and Perthshire	F.	1823	14, Cowgate-street, Dundee	P. H. Thoms, Man.
Freemasons' and General	L. S. A. & L.	1838	11, Waterloo-place	J. Berridge.
Friends' Provident Institution	L. A. E. &c.	1832	Bradford, Yorkshire	Benjamin Ecroyd.
General	L. & F.	1837	62, King William-street	Thomas Price, LL.D.
General	Hail Storm	1843	Bethel-street, Norwich	C. S. Gilman.

INSURANCE COMPANIES—*continued.*

TITLE.	*Objects.*	*Founded*	*Offices.*	*Secretary.*
General Annual Endowment Association	E. A.	1839	46, King William-street, City	Charles Hewitt.
General Benefit	L. & H.	1839	4, Farringdon-street, Blackfriars	John Brydie.
General Commission Ship Loan	M. I. &c.	1846	71, Cornhill	J. N. Burnand, M. Dir.
General Reversionary and Investment	P. R. &c.	1836	5, Whitehall	W. B. Hodge.
Glasgow Annuity Society	A.	1808	49, Virginia-street, Glasgow	Thomas Brown.
Globe	F. L. & A.	1803	Pall Mall and Cornhill	J. C. Denham.
Great Britain	L. A. & E.	1844	79, King William-street	A. R. Irvine, Man. Dir.
Great Yarmouth Amicable	S.	1793	Regent-street, Yarmouth	J. H. Palmer.
Gresham	L. & D. L.	1848	37, Old Jewry	T. A. Pott.
Guarantee Society	Fidelity	1840	19, Birchin-lane	Thomas Dodgson.
Guardian	F. L. & A.	1821	11, Lombard-street	George Keys.
Halifax, Bradford, and Keighley	F. & L.	1845	Waterhouse street, Halifax	F. C. Spenser.
Hand in Hand	F. L. & A.	1696	1, New Bridge-street, Blackfriars	Robert Steven.
Hants, Sussex, and Dorset	F.	1803	Gosport	David Compigne.
Hercules	F.	1809	37, North Bridge, Edinburgh	J. Wood, Man.
Impartial	Car. & Frt.	1793	16, King-street, South Shields	George Potts.
Imperial	F.	1803	16, Pall Mall	J. C. C. Bell, Man.
Imperial	L.	1820	16, Pall Mall	S. Ingall.
India and London	L.	1846	79, King William-street	A. R. Irvine.
Indisputable	L.	1848	31, Lombard-street	D. Alison.
Indemnity Marine	M. I.	1824	36, Great Winchester-street	N. Chester.
Insurance Company of Scotland	F.	1821	96, George-street, Edinburgh	D. Maclagan, Man.
Kent	F.	1802	High-street, Maidstone	Edward Hughes.
Kent Mutual	F. & Ship.	1844	High-street, Rochester	Thomas Burr.
——— (London Office)	F.	1846	44, Old Broad-street	Thomas A. Burr.
Law	F.	1845	5 and 6, Chancery-lane	Edward Blake Beal.
Law	L.	1823	Fleet-street	W. S. Downes.
Leeds and Yorkshire	F. & L.	1824	Commercial-buildings, Leeds	William Lister.
Legal and Commercial	L. & F.	1845	73, Cheapside	J. C. Hardy.
Legal and General	L.	1836	10, Fleet-street	
Licensed Victuallers'	F. & L.	1835	4, Adelaide-place, London-bridge	John Bigg.
Life Association of Scotland	L. & A.	1839	2, Hanover-street, Edinburgh	John Bowman.
——— (London Board)	L. & A.	1839	64, Old Broad-street	T. Fraser, Res. Sec.

LIVERPOOL AND LONDON	F. L. & A.	1836	8, Water-street, Liverpool	Swinton Boult.
——— (London Board)	F. L. & A.	1846	3, Charlotte-row, Mansion House	Benjamin Henderson.
LONDON ANNUITY SOCIETY	Wids. of M.	1765	11, Chatham-place, Blackfriars	Rev. R. H. Shepherd.
LONDON ASSURANCE CORPORATION	F. L. & M.	1720	7, Royal Exchange, and 10, Regent-street	John Laurence.
LONDON AND PROVINCIAL	Jt. S. Lf. &c.	1846	39, Nicholas-lane, Lombard-street	T. Foley, F.R.A.S.
LONDON AND PROVINCIAL LAW	L.	1845	32, Bridge-street, Blackfriars	John Knowles.
LONDON LIFE ASSOCIATION	L.	1806	81, King William-street	Edward Docker.
LONDON REVERSIONARY INTEREST	Pur. of Rev.	1836	4, New Bank-buildings, & 10, Pall Mall E.	Henry T. Thomson.
MANCHESTER	F.	1824	98, King-street, Manchester	Herbert Spring.
MARINE	Ins. S. & G.	1836	27, Cornhill	Robert John Lodge.
MARINE (Liverpool)	M.	1831	Exchange-buildings, Liverpool	T. Irvine.
MARINERS AND GENERAL	L.	1843	5, Arthur-street east, City	T. Foley, F.R.A.S.
MARITIME AND MERCANTILE	Shipping	1798	70, King-street, South Shields	J. W. Lamb.
MEDICAL, INVALID, AND GENERAL	D. & H. L.	1841	25, Pall Mall	F. G. P. Nelson.
MEDICAL, LEGAL, AND GENERAL	L. A. E. & L.	1846	126, Strand	Frederick James Bigg.
MENTOR	L.	1848	2, Old Broad-street	L. More, Man.
MERCANTILE	L.	1844	4, St. Andrew's-square, Edinburgh	Robert Reinie.
MERCHANTS AND TRADESMEN'S	L. & A.	1844	5, Chatham-place, Blackfriars	T. Musgrave.
METROPOLITAN	L.	1835	3, Princes-street, Bank	Rich. Heathfield, Sup.
METROPOLITAN COUNTY AND GENERAL	L. & A.	1848	27, Regent-street, Waterloo-place	F. F. Camroux, Man.
MINERVA	L. & Sur.	1836	84, King William-street, City	W. T. Robinson.
MITRE	L.	1846	23, Pall Mall	S. P. Plumer.
MUTUAL ACCUMULATION	End. & Sur.	1837	17, George-street, Edinburgh	R. Balfour.
MUTUAL INSURANCE	End. & A.	1820	51, Threadneedle-street	James Bishop.
MUTUAL	L.	1834	King-street, Cheapside	P. Hardy, F.R.S.
NATIONAL ASSURANCE OF IRELAND	L. F. & M.	1822	3, College-street, Dublin	Joseph Todhunter.
NATIONAL DEBT OFFICE	Gov. Ans.	1697	Old Jewry	J. Finlaison.
NATIONAL FRIENDLY SOCIETY	L. H. & A.	1846	21, Red Lion-square	W. J. Reynolds.
NATIONAL INSURANCE INVESTMENT	L. & A.	1844	7, St. Martin's-place, Trafalgar-square	Joseph Macardy.
NATIONAL INSURANCE OF SCOTLAND	F. & L.	1841	2, South St. David-street, Edinburgh	J. M. McCandlish.
NATIONAL LOAN FUND	L. S. & A.	1837	26, Cornhill	W. Woolhouse, F.R.A.S.
NATIONAL LIFE SOCIETY	L.	1830	2, King William-street, City	Charles B. Smith.
NATIONAL MERCANTILE	L. F. & A.	1837	Poultry	Jenkin Jones.
NATIONAL PROVIDENT	L. & A.	1835	48, Gracechurch-street	Joseph Marsh.
NATIONAL REVERSIONARY	R. C.	1838	63, Old Broad-street	G. A. Rendall
NAUTICAL INSURANCE	M. S.	1780	16, King-street, South Shields	George Potts.
NEWCASTLE-UPON-TYNE	F. L. & A.	1783	6, Side-street, Newcastle	William Woods.
NORTH BRITISH	F. L. & S.	1809	4, Bank-buildings, & 10, Pall Mall East	Henry T. Thomson.
NORTH OF ENGLAND	F. L. & A.	1847	11, Cheapside	William Goodchap.

INSURANCE COMPANIES—*continued.*

TITLE.	*Objects.*	*Founded*	*Offices.*	*Secretary.*
NORTHERN	F. & L.	1836	3, King-street, Aberdeen	H. Ambrose Smith.
——— (London Board)	L. & A.	1836	1, Moorgate-street	A. P. Fletcher.
NORWICH EQUITABLE	F.	1839	Bank-street, Norwich	John Skipper.
NORWICH MUTUAL	Ship. & Gds.	1843	Norwich	J. Colman & J. Copeman.
NORWICH UNION	F. & L.	1797	Norwich	Samuel Bignold.
——— (London)	F. & L.	1797	6, Crescent, New Bridge-street, Blackfriars	C. J. Bunyon.
NORWICH UNION	R.	1836	23, Lincoln's-Inn-fields	Henry Norris.
NOTTINGHAMSHIRE AND DERBYSHIRE	F. & L.	1835	Park-street, Nottingham	H. M. Wood.
OLD SHIPPING ASSOCIATION	M.	1780	Regent-street, Yarmouth	J. H. Palmer.
PALLADIUM	L. & S.	1824	7, Waterloo-place	Jeremiah Lodge.
PATRIOTIC	L. & F.	1824	9, College-green, Dublin	William Robinson.
PELICAN	L.	1797	Lombard-street and Charing-cross	R. Tucker.
PHŒNIX	F.	1782	19, Lombard-street and Charing-cross	Thomas Richter.
PORT OF LONDON	M.	1847	20, St. Helen's-place, Bishopsgate	Aug. Collingridge, Man.
PRESERVER	L. & F.	1843	Bond Court-house, Walbrook	H. C. Morris.
PROFESSIONAL	L. C. & R.	1847	76, Cheapside	Edward Baylis.
PROFESSIONAL	A.	1846	St. Vincent-square, Glasgow	W. Hunter.
PROMOTER	L. & A.	1836	9, Chatham-place, Blackfriars	M. Saward.
PROTECTING	M.	1839	Market-place, South Shields	Thomas Adams.
PROVIDENT	L.	1807	50, Regent-st., & 2, Royal Exchange-build.	Henry Beaumont.
PROVIDENT CLERKS'	L. & B. F.	1840	42, Moorgate-street, City	T. Mullinder, LL.D., &c.
PRUDENTIAL MUTUAL	L. I. & L.	1848	14, Chatham-place, Blackfriars	John Shillingford.
RELIANCE (Mutual)	L.	1840	71, King William-street, City	Gilbert Smith, F.S.A.
REVERSIONARY INTEREST SOCIETY	R. & P. pur.	1823	17, King's Arms-yard	C. G. Christmas.
ROYAL	L. & F.	1845	29, Lombard-street	John B. Johnston.
ROYAL EXCHANGE	F. L. A. & S.	1720	Royal Exchange, and 29, Pall Mall	Alexander Green.
ROYAL FARMERS'	F. L. & H.	1839	346, Strand	John Hanson.
ROYAL NAVAL, MILIT., EAST-INDIA, AND GEN.	L.	1837	13, Waterloo-place	Joseph C. Brettell.
ROCK	L. & S.	1806	14, New Bridge-street, Blackfriars	John Goddard.
SAFEGUARD	M. P.	1821	16, King-street, South Shields	George Potts.
SALOP	F.	1780	Corn-market, Shrewsbury	E. B. Tipton.
SCOTTISH AMICABLE	L.	1826	52, Broad street, and 8, Exeter Hall	J. B. Foord & J. Miller.
SCOTTISH EQUITABLE	L.	1831	26, St. Andrew's-square, Edinburgh	R. Gibson.

SCOTTISH EQUITABLE (London Office)	L.	1844	61A, Moorgate-street	William Cook.
SCOTTISH PROVIDENT	L. & A.	1837	14, St. Andrew-square, Edinburgh ..	John Watson.
——— (London Board)	L. & A.	1845	12, Moorgate-street	Wilmer Owen Harris.
SCOTTISH REVERSIONARY	R. I.	1840	19, Albany-street, Edinburgh	W. & R. Rhind, W.S.
SCOTTISH SEA	M.	1848	3, King's-street, Dundee	S. Brodie, Man.
SCOTTISH WIDOWS' FUND	L. & S.	1834	7, Pall Mall, and Royal Exchange-buildgs.	Hugh McKean.
SCOTTISH UNION	F. & L.	1824	47, George-street, Edinburgh	James Barlas.
——— (London Board)	F. & L.	1824	37, Cornhill	F. G. Smith.
SHEFFIELD	F.	1808	George-street, Sheffield	William Brownell.
SHROPSHIRE AND NORTH WALES	F.	1836	High-street, Shrewsbury	E. Elsmere, Man. Dir.
SOLICITORS AND GENERAL	L.	1846	57, Chancery-lane	Charles John Gill.
SOVEREIGN	L.	1845	5, St. James's-street	H. D. Davenport.
STANDARD	L.	1825	3, George-street, Edinburgh	W. T. Thomson, Man.
——— (London Board)	L.	1825	82, King William-street	Peter Ewart, Res. Sec.
STAR	L. & F.	1843	44, Moorgate street, City	W. Hillman.
SUFFOLK	F.	1803	Ipswich and Bury	W. Bullar.
SUN	F.	1710	Threadneedle-st. & Craig's-ct. Char. Cross	John Richards.
SUN	L.	1810	Threadneedle-street	Charles H. Lidderdale.
SUN	Shipping	1836	Barrington-street, South Shields ..	C. A. Wawn.
TEMPERANCE AND GENERAL PROVIDENT ..	L. & A.	1840	39, Moorgate-street, City	T. Compton.
TONTINE	L. & A.	1845	20, Pall Mall	William Scott.
UNANIMOUS	Ins. Ships	1826	16, King-street, South Shields	George Potts.
UNION	F. L. & A.	1714	Cornhill and Baker-street	Thomas Lewis.
UNION	M.	1800	Castle-street, Dundee	George Boyd, jun.
UNITED DEPOSIT	L.	1845	21, St. Andrew-square, Edinburgh ..	Joseph Maitland, Man.
UNIVERSAL	L.	1834	1, King William-street, City	Michael E. Impey.
UNIVERSITY	L.	1825	24, Suffolk-street, Pall Mall	Charles M. William.
UNITED KENT	L. & A.	1824	High-street, Maidstone	Edward Hughes.
UNITED KINGDOM	L. S. & A.	1834	8, Waterloo-place	E. L. Boyd, Res. Dir.
UNITED KINGDOM CATTLE	H. & C.	1847	68, Cheapside	John Holroyd.
VICTORIA	L.	1838	18, King William-street, Mansion-house	William Ratray.
WESLEYAN PROVIDENT	L. & A.	1841	Cherry-street, Birmingham	James English.
WEST OF ENGLAND	F. L. & A.	1807	20, New Bridge-street, Blackfriars ..	J. Anderton, Man.
WESTERN	L. & A.	1842	3, Parliament-street, Westminster ..	A. Scratchley, M.A.
WESTERN	A.	1836	St. Mary Axe	T. Wardell.
WESTMINSTER AND GENERAL	F. & L.	1717	27, King-street, Covent Garden	W. M. Browne.
WESTMINSTER	L.	1792	429, Strand	John Helps.
WIDOWS' GENERAL	Ann. & End.	1810	16, Upper Sackville-street, Dublin ..	William Heney.
YORKSHIRE	F. & L.	1824	Royal Exchange, and 24, Bow-street ..	Wilson & Dimsdale.

BRITISH MINING COMPANIES.

Name.	Sec. or Purser.	Office.
Abergwesain Mining Company	P. P. Couch ..	Nantyrian-house. [bard-st.
Alfred Consols Mining Company ..	H. Thomas ..	8, George-yd., Lom-
Antimony and Silver Lead Mining Co.	T. Bartlett	36, Lombard-street.
Ashburton and United Mining Company	A. Murray	Craven-st., Strand.
Balleswidden Mining Company	R. N. Davis.. ..	Mine.
Balnoon Consols Mining Company ..	J. Roscolla	Mine.
Banwen Iron Company	S. P. Harris ..	23, Threadneedle-st.
Barristown Mining Company	T. Hacket	26, Birchin-lane.
Bedford United Mines	G. Kieckhoefer ..	50, Threadneedle-st.
Birch Tor Tin Mine	—	Plymouth.
Blaenavon Iron Company	J. Booth	4, Pancras-lane.
Botallack Mine Company	J. H. James ..	Penzance.
Brewer Mine	G. Simmons ..	Truro.
British Iron Company	J. Smith	South Sea-house.
Budnick Consols Mine	E. Mitchell	Truro.
Callington Mining Company	P. Stainsby	44, Finsbury-square.
Camborne Consols Mining Company ..	F. Daniel	29, Poultry.
Cameron Steam Coal Company ..	J. Howden	2, Moorgate-street.
Caradon Copper Mine Company ..	P. Clymo, jun. ..	Liskeard.
Caradon Mine Company	S. Seccombe ..	Liskeard.
Caradon United Mining Company ..	W. D. Bonse ..	Liskeard.
Caradon Wheal Hooper		
Carn Brea Mining Company	J. MacDonnell ..	35, Broad-st.-bldgs.
Carthew Consols Mining Company ..	W. Shearman ..	Manchester.
Carwinning Hill Mining Company ..	J. A. Tulins.. ..	33, Clement's-lane.
Charlestown Mining Company	Jno. Taylor.. ..	Duke-st., Adelphi.
Contlithe Hill Mining Company ..	T. P. Thomas ..	George-yard. [side.
Comb Lawn Mining Company	J. Crofts	4, King-st., Cheap-
Comfort Mining Company	S. & R. Davey ..	Redruth.
Condurrow Mining Company	N. Vivian	Camborne.
Cook's Kitchen Mining Company ..	R. H. Pike	Redruth.
Combe Valley Quarry	C. S. Richardson ..	5, White Friars-st.
Cornish Mining Company	Geo. Owens ..	Monument-chmbrs.
Cornwall New Mining Company ..	G. Lockwood ..	17, Essex-st., Strand.
Copper Bottom Mining Company ..	—	Camborne.
Craddock Moor Mining Company ..	E. A. Crouch ..	Liskeard.
Creeg Braws Mining Company	J. Freeman	Chacewater.
Cubert Mine	H. Thomas	8, George-yard.
Cwm Erfin Mining Company	T. P. Thomas ..	8, George-yard.
Cwm Ystwith Mining Company ..	J. MacDonnell ..	35, Broad-st.-bldgs.
Dean Prior and Buckfastleigh Min. Com.	C. Bourdillon ..	25, Fleet-street.
Derwent Mining Company	B. O'Connor ..	24, Dowgate-hill.
Devon and Courtney Consols Min. Com.	W. Rendle	Plymouth.
Devonshire Great Consols Mining Com.	A. Allen	Barge-yd.,Buckhrsb.
Dolcoath Mining Company	Com. Adventurers..	Camborne.
Drake Walls Mining Company	P. Stainsby	44, Finsbury-square.
Durham County Coal Company ..	W. Brogden ..	Stockton.
Dyfngwm Mining Company	G. Hadley	2, Royal Exch-build.
East Birch Tor Mining Company ..	J. Tapprell	2, Winchester-street.
East Caradon Mining Company ..	Capt. Clymo ..	Liskeard.
East Crowndale Mining Company ..	E. J. Cole	Winchester-house.
East Pool Mining Company	Com. of Management	Camborne.
East Tamar Consols Mining Company	G. Kieckhoefer ..	50, Threadneedle-st.

Name.	Sec. or Purser.	Office.
East Wheal Crofty Mining Company ..	Adventurers. ..	Mine Camborne.
East Wheal Rose Mining Company ..	E. Mitchell	Truro.
East Wheal Seton	Capt. Evans.. ..	Mine.
Esgair Lle Mining Company	T. P. Thomas ..	George-yard.
Exmoor Wheal Eliza Mining Company	J. H. Hitchens ..	Exeter.
Fowey Consols Mining Company ..	W. Davis, Capt. R. M.	Fowey.
Gadair Mining Company	N. Truscott ..	Swan-chambers.
General Mining Company for Ireland..	T. Macguire ..	2, Burgh-quay, Dub.
Gonamena Mining Company	E. A. Crouch ..	Liskeard.
Great Consols Mining Company ..	Com. of Management	Gwennap.
Great Polgooth	—	38, New Broad-st.
Great Wheal Rough Tor Consols Mg. C.	W. A. Thomas ..	50, Threadneedle-st.
Growan Slate Company	W. W. Mansell ..	57, Threadneedle-st.
Gwinear Consols Mining Company ..	R. R. Mitchell ..	3, King's-court.
Halkin Mining Company..	J. Brand	23, King-st. St. James
Heigneton Down Consolidated Min. Co.	G. Kieckhoefer ..	50, Threadneedle-st.
Herodsfoot Mining Company	W. D. Boase ..	Liskeard.
Hibernian Mining Company	W. H. Porter ..	Austin-friars.
Holmbush Mining Company	H. Thomas	8, George-yard.
Holyford Copper Mines	J. W. Buckland ..	34, Gt Winchester-st.
Keswick Mining Company	W. Brown	8, Walbrook.
Kilbricken Mining Company	J. Brand	23, King-st. St. James
Kingsett and Bedford Mining Company	J. Tirnewell ..	Exeter.
Kirkcudbrightshire Mining Company ..	T. Hacket	26, Birchin-lane.
Lamerhooe Wheal Maria Mining Com.	J. Crofts	4, King-street.
Lanarth Consols Mining Company ..		
Lelant Consols Mining Company ..		
Levant Mining Company		
Lewes Mining Company	P. Stainsby	44, Finsbury-sq.
Llwyn Malles Mining Company ..	J. Maitland	12, Copthall-court.
Llynvi Iron Company	—	Moorgate-street.
Lostwithiel Consols Mining Company..	J. Crofts	4, King-street.
Marke Valley Mining Company.. ..	Capt. Seccombe ..	Linkinhorne.
Mendip Hills Mining Company	P. Stainsby	44, Finsbury-sq.
Metha Mining Company	Bullock & Luscombe	Lincoln's-inn.
Mining Company of Ireland	R. Purnly	Low. Orm.-qy., Dubln
New East Crowndale Mining Company		
North Pool Mining Company	H. Borrow	
North Roskear Mining Company ..	— Hutchinson ..	Camborne.
North Wheal Leisure Mining Company		
North Wheal Bassett	R. Lyle	34, Gt Winchester-st
Par Consols Mining Company	W. Davis, Capt. R. M.	Fowey.
Pennant and Craigwen Mining Company	W. W. Mansell ..	57, Threadneedle-st.
Penrhw Mining Company		
Peny-Cefn Lletenhen Mines	H. L. T. Von Uster	29, Poultry.
Penzance Consols Mining Company ..	J. Carthew	
Plymouth Wheal Yeoland Mining Com.	—	Jump.
Polsaith Consols Mining Company ..	R. Taylor	St. Cleer.
Rhoswiddol and Bacheldon Mining Co.		
Rhymney Iron Company	T. E. Scudamore ..	Lawrence Pountney-hill.
Rosewall Hill Mining Company ..		
Runnaford Coombe Tin Mining Com...		
South Tamar Consols Mining Company	G. Kieckhoefer ..	50, Threadneedle-st.
South Caradon Mining Company ..	T. Kittow	Liskeard.
South Dolcoath Mining Company ..	P. Stainsby	44, Finsbury-sq.
South Friendship Wheal Ann Min. Com.	— Cudlipp	Tavistock.
South Molton Mining Company .	J. Clymo	Liskeard.
South Tolgus Mining Company ..	J. Taylor	2, Duke-st., Adelphi.
South Trelawney Mining Company ..	T. Hackett	26, Birchin-lane.
South Wales Mining Company	J. P. Thomas ..	George-yard.
South Wheal Basset Mining Company..	W. Richards ..	Redruth.
South Wheal Josiah Mining Company..	J. Hambly	Calstock.

Name.	Sec. or Purser.	Office.
South Wheal Maria Mining Company	—	Tavistock.
Southern and Western Irish Min. Com.	W. Connell	South Mall, Cork.
Spearne Moor Mining Company	—	Ballesswidden.
St. Anstell Consols Mining Company	— Hodge	St. Anstell.
St. Michael Penkwel	— Lowry	Truro.
St. Minver Consols Mining Company	—	Padstow.
Stray Park Mining Company	W. Vawdrey	
Tamar Consols Mining Company	P. Stainsby	44, Finsbury-sq.
Tavy Consols Mining Company	P. Fisher	Plymouth.
Tincroft Mining Company	P. Stainsby	44, Finsbury-sq.
Tin Vale Mining Company	W. W. Mansell	57, Threadneedle-st.
Tollorgoch	— Jones	Rill, Flintshire.
Tregordan Mining Company	J. Philp	Liskeard.
Trehane Mining Company	J. Philp	Liskeard.
Treleigh Consols Mining Company	W. Nicholson	Old Broad-street.
Trenance Mining Company	T. Watson	12, Cornhill.
Tresavean Mining Company	W. Richards	Bond-ct., Walbrook.
Trethellan Mining Company	W. Richards	Bond-ct., Walbrook.
Treviskey and Barrier Mining Company	J. Williams, jn. & Brs.	Scorrier, Truro.
Trevean Mining Company	J. Hayward	Rood-lane.
United Mines Company	J. Taylor	Duke-st., Adelphi.
Venton Gimpa Mine	J. J. Iselin	4, Austinfriars.
Wellington Mines Company	H. Thomas	8, George-yard.
West Buller Mining Company	J. & R. Davey	Redruth.
West Caradon Mining Company	E. A. Crouch	Liskeard.
West Fowey Consols Mining Company	W. Davis	Fowey.
West Providence Mining Company	R. R. Michell	Marazion.
West Seton Mining Company	R. Harvey	St. Day.
West Trethellan Mining Company	W. Richards	Redruth.
West United Hills Mining Company	H. Ellery	Truro.
West Wheal Francis Mining Company	J. Reynolds	Camborne.
West Wheal Jewel Mining Company	W. Nicholson	Old Broad-street.
West Wheal Tolgus Mining Company	W. Richards	Redruth.
West Wheal Treasury Mining Company	W. Burgess	Camborne.
Wicklow Copper Mines Company	J. Barnes	Vale of Ovoca.
Wheal Adams Mining Company	T. Hackett	26, Birchin-lane.
Wheal Agar Mining Company	J. MacDonnell	Broad-st.-buildings.
Wheal Anderton Mining Company	J. Carpenter	Tavistock.
Wheal Anna Maria Mining Company	—	Dunsford, nr. Exeter.
Wheal Ash Mining Company	—	Tavistock.
Wheal Bal Mining Company	J. Carthew	St. Just. [Manch.
Wheal Barbara	W. Shearman	StampOffice-buildgs.
Wheal Benny Mining Company	J. Crofts	4, King-street.
Wheal Biencowe Mining Company	J. Dale	Mine.
Wheal Bucketts Mining Company	G. A. Knight	Truro.
Wheal Calstock Mining Company	—	Calstock.
Wheal Coad Mining Company	—	Lombard-street.
Wheal Comfort	—	Mine.
Wheal Courtenay Mining Company	E. Lyne	St. Columb.
Wheal Fortescue Mining Company	J. Matthews	Tavistock.
Wheal Franco Mining Company	—	Tavistock.
Wheal Henry Mining Company	J. Tippett	Truro.
Wheal Jane	H. Thomas	8, George-yard.
Wheal Lawrence Mining Company	W. Winterbotham	3, Winchester-bldgs.
Wheal Mary Ann Mining Company	P. Clymo, jun.	Liskeard.
Wheal Mary Consols Mining Company	E. A. Crouch	Liskeard.
Wheal Penhale Mining Company	W. Shearman	Manchester.
Wheal Reeth Consolidated Mines Comp.	—	Albion-st., Leeds.
Wheal Russell	J. H. Hitchens	Tavistock.
Wheal Sarah	H. Thomas	8, George-yard.
Wheal Seton Mining Company	T. & H. Tilly	Falmouth.
Wheal Sisters Mining Company	E. A. Crouch	Liskeard.

Name.	Sec. or Purser.	Office.
Wheal Sophia Mining Company ..	J. Bennett	Mine.
Wheal Trehane	J. Philp	Liskeard.
Wheal Trescoll Mining Company ..	C. S. Richardson ..	5, Whitefriars-street.
Wheal Trelawney Mining Company ..	J. Bryant	Liskeard.
Wheal Tremayne Mining Company ..	H. Thomas	George-yard.
Wheal Williams Mining Company ..	N. Bassett	Truro.

FOREIGN MINES.

Name.	Place.	Secretary.	Office.
Alten Mining Company ..	Norway	J. E. Cole	Winchester-house.
Asturian Mining Company ..	Spain ..	K. Mackenzie ..	9, Austin-friars.
Australian Mining Company	Australia	— Josephs	2, Adelaide-place.
Anglo-Mexican Mining Assoc.	Mexico	J. Godfrey	5, Broad-st.-bldgs.
Anglo-Mexican Mint Company	Mexico	G. B. Lonsdale ..	5, Broad-st.-bldgs.
Barossa Range Mining Comp.	Australia	Coode, Brown, & Co.	13, Bedford-row.
Bolanos Mining Company ..	Mexico	J. Taylor	2, Duke-st., Adelphi.
Brazilian Imperial .. .	Brazils	G. Thomas, Man. Dir.	Winchester-house.
Cobre Copper Mine Company	Cuba ..	W. Leckie	26, Austin-friars.
Copiapo Mining Company ..	Cuba ..	F. Grelliett	26, Austin-friars.
General Mining Association..	No. Scot.	T. B. Frood.. ..	52, Old Broad-street.
Guadalcanal Mining Company	Spain ..	H. T. Ryde	34, Broad-st.-bldgs.
Kinzigthal Mining Association	Australia	G. C. Capper ..	1, Adelaide-place.
Mexican Company	Mexico	J. M. Maude ..	Gt. Winchester-st.
Mexican & S. American Com.	Mexico	H. W. Schneider ..	10, Nw. Broad-st. mws
National Brazilian Mg. Assoc.	Brazils	E. Oxenford, Mn. Dir.	26, Throgmorton-st.
North British Australasian ..	Australia		
Real Del Monte Mining Com.	Mexico	J. Phillips	2, Duke-st., Adelphi.
Royal Santiago Mining Assoc.	Cuba ..	— Docker	Broad-st.-buildings.
St. John del Rey Min. Assoc.	Brazils	W. Routh	8, Tokenhouse-yard.
United Mexican Ming. Assoc.	Mexico	J. Mather	5, Finsbury-crescent
Worthing Mining Company ..	S. Austrl.	J. Watson	St. Michl's-al., Crnhl.

GENERAL POSTAL REGULATIONS, &c.

RATES OF POSTAGE.—All Letters from one part of Great Britain to another are charged, if prepaid and not exceeding half an ounce, 1*d.*; exceeding half an ounce, and not exceeding one ounce, 2*d.*; and so on, at the rate of 2*d.* for every additional ounce or fraction of an ounce. Unpaid and unstamped letters are charged double postage on delivery.

MONEY-ORDER OFFICE.—Parties having occasion to transmit small sums, may do so through the Post-Office with entire safety, by procuring a *money-order*, which for sums *not exceeding two pounds* may be obtained for 2*d.*, and for sums *not exceeding five pounds*, 6*d.* In granting money orders, and in advising of the same, one Christian name in full for either the payee or the remitter will be sufficient, instead of all the Christian names being furnished in full, as hitherto required. With a view to simplicity and economy, it has been found necessary to lay down the following rules:—1. Every money-order issued on or after the 6th October, 1848, must be presented for payment before the end of the second calendar month after that in which it was issued. 2. If an order be not presented for payment before the end of the twelfth calendar month after that in which it was issued, the money will not be paid at all. 3. After once paying a money-order, the office will not be liable to any further claim. Never send a money-order in the same letter with the information required on payment thereof.

MORNING MAILS are forwarded to most of the principal towns in England and Wales, and to all parts of Ireland and Scotland.

PACKAGES which in length, breadth, or width exceed twenty-four inches, cannot be forwarded by post between any places within the United Kingdom; except, however, petitions or addresses to her Majesty, or petitions to either House of Parliament forwarded to any member of either House, or printed votes or proceedings of Parliament, or letters to or from any Government offices or departments.

Any SINGLE BOOK or PAMPHLET can now be sent through the post-office to any part of the United Kingdom, if not exceeding 16 oz. in weight, and open at both ends, by affixing six postage-stamps.

NEW POSTAGE STAMPS, intended principally for the prepayment of foreign letters, have been issued. They are of the value of one shilling each.

LONDON DISTRICT POST-OFFICE.—The principal office is at the General Post-Office, St. Martin's-le-Grand, where letters may be posted one hour later up to 12 o'clock, and three-quarters of an hour later at each despatch up to 6 o'clock, than at the receiving-houses. There are *ten* deliveries of letters in London daily.

NEWSPAPERS and PRINTED PAPERS.—Newspapers are entitled to pass free. They must be put into the receiving-houses before 5 P.M. or 7 A.M.; at the branch post-offices before half-past 5 P.M. or half-past 7 A.M.; or at the General Post-Office, St. Martin's-le-Grand, before 6 P.M., or a quarter before 8 A.M. Newspapers put into the late Newspaper Windows, at St. Martin's-le-Grand, from 6 until half-past 7 P.M., with a halfpenny each, will be despatched the same evening. Newspapers for the Colonies and foreign countries cannot be received after 6. Newspapers to the British Colonies and possessions pass free if posted within seven days after the day of publication (the Cape of Good Hope excepted, there being no regular packet to that place). To other foreign ports the postage on each newspaper is either 1*d.* or 2*d.* Newspapers pass free to France and Belgium, but are charged on delivery with a fee of 4 centimes (nearly one halfpenny). Newspapers from France and Belgium are charged with a fee of one halfpenny on delivery here.

REGISTRATION.—This consists in the payment of a fee of 6*d.*, in addition to the ordinary rate of postage, for which a printed acknowledgment is given by the postmaster, and the safe delivery of the letter is guaranteed by the Post-Office. In the case of foreign, colonial, or ship letters, this guarantee only extends to the port of despatch in the United Kingdom—letters addressed to France form an exception. The registration 6*d.* must always be paid *in money*, but the prepayment of postage may be effected in the usual way, by the letter bearing the required number of

stamps. Registered letters must be posted half an hour before the ordinary time for closing the box.

PRICES CURRENT, when bearing a newspaper stamp and under 2 oz., are subject to the same rates as newspapers; unstamped price-currents, such as Lloyd's List, London New Price Current, &c. &c., are charged 1*d.* to any part.

FOREIGN MAILS are made up in London for France, and all places through France, daily, except Sunday.—Hambro' and Holland, Tuesday and Friday.—Flanders, daily, except Sunday.—Spain and Portugal, 7th, 17th, and 27th of each month.—Brazil, &c., first Tuesday in the month.—Mediterranean, Greece, &c., *vid* Falmouth, Saturday nearest the 15th and last day of each month.—Egypt, China, and Australia, *vid* Southampton, 3rd and 20th of each month, and 7th and 24th of each month *vid* Marseilles.—West Indies, 1st and 15th o' each month.—Mexico, &c., 1st of each month.—North America, 2nd and 18th of each month.

FOREIGN PACKET RATES OF LETTERS.

BY FALMOUTH OR SOUTHAMPTON PACKETS.

Between the United Kingdom and

	s.	d.
*Lisbon	1	9
*Spain (by Falmouth Packet)	2	2
*Greece, Egypt, and Syria	1	6
*Madeira	1	10
*Brazil	2	9
*Buenos Ayres	2	7
*Panama, Chili, and Peru	2	0
*Hayti	1	8
*La Guayra, Mexico, Cuba, and Carthagena	2	1
Gibraltar, Malta, *Ionian Islands, *Honduras, British West Indies, *India, *vid* Falmouth	1	0

BY PACKET FROM LIVERPOOL.

	s.	d.
*United States, Bermuda, Halifax, N.S., Newfoundland	1	0
*British North Amer., *vid* Boston		
Upper and Lower Canada, Prince Edward Island, New Brunswick, & Nova Scotia (Halifax excepted)	1	2

BY PACKETS FROM DOVER.

Between the United Kingdom and

	s.	d.
Belgium — British rate	0	8
Belgian	0	4
France (British rate to Calais)	0	5
French rate to any part	0	5
Letters *vid* France to *Turkey, Levant, Ionian Islands, Austria, Venetian Lombardy, Switzerland, Germany, Belgium, and Holland, need only be paid to Calais	0	5
And *vid* France to *Spain, Portugal, Sardinia, Southern Italy	0	10
*India, as far as Bombay	1	10

BY PACKETS FROM LONDON.

Between the United Kingdom and

	s.	d.
*Holland	1	0
*Germany, Denmark, Sweden, and Russia	1	6
*Heligoland	0	6
*Hamburgh, Cuxhaven, Lubeck, and Bremen	0	6
*Grand Duchy of Oldenburg	0	6

* The postage to all these destinations must be paid in advance.

STAMP DUTIES.

BILLS.

Not exceeding 2 months aft. date, or 60 days aft. sight.						Longer period.		
For £2		£5	5s.	1	0	..	1	6
Above 5	5s.	20		1	6	..	2	0
20	30	30	..	2	0	..	2	6
30	50	50	..	2	6	..	3	6
50	100	100	..	3	6	..	4	6
100	200	200	..	4	6	..	5	0
200	300	300	..	5	0	..	6	0
300	500	500	..	6	0	..	8	6
500	1,000	1,000	..	8	6	..	12	6
1,000	2,000	2,000	..	12	6	..	15	0
2,000	3,000	3,000	..	15	0	..	25	0
3,000		..	..	25	0	..	30	0

Penalty for post-dating Bills of Exchange, £100.

FOREIGN.

When in sets, then for every bill of each set not exceed.						s.	d.
£100					..	1	6
Above 100 and not above				200	..	3	0
200	..	..		500	..	4	0
500	..	..		1,000	..	5	0
1,000	..	..		2,000	..	7	6
2,000	..	..		3,000	..	10	0
3,000	..	..		..	..	15	0

N.B.—Promissory notes for £100 or under are not to be drawn payable to the bearer on demand, except bankers' reissuable notes, which require a different stamp.

AGREEMENTS.

Of the value of £20 and upwards, containing only 1080 words, 2s. 6d.; more than 1080 words, £1. 15s.; and for every further 1080 words, £1. 5s. Agreements requiring the 2s. 6d. stamp must be stamped within fourteen days from the date; afterwards they can only be stamped upon payment of a penalty of £10.

CONVEYANCES.

When consideration under £20 .. 10s.

Under		Duty		Under		Duty
£50	..	£1	0	8,000	..	£75
150	..	1	10	9,000	..	85
300	..	2	0	10,000	..	95
500	..	3	0	12,500	..	110
750	..	6	0	15,000	..	130
1,000	..	9	0	20,000	..	170
2,000	..	12	0	30,000	..	240
3,000	..	25	0	40,000	..	350
4,000	..	35	0	50,000	..	450
5,000	..	45	0	60,000	..	550
6,000	..	55	0	80,000	..	650
7,000	..	65	0	100,000	..	800

LETTERS OF ATTORNEY.

Commission or factory, or deed of procuration £1 0

Progressive duty on words.

PROBATE OF WILLS, &c.

	With a Will.	Without a Will.
Under £50 ..	— ..	£0 10
100 ..	£0 10 ..	1 0
200 ..	2 0 ..	3 0
300 ..	5 0 ..	8 0
450 ..	8 0 ..	11 0
600 ..	11 0 ..	15 0
800 ..	15 0 ..	22 0
1,000 ..	22 0 ..	30 0
1,500 ..	30 0 ..	45 0
2,000 ..	40 0 ..	60 0
3,000 ..	50 0 ..	75 0
4,000 ..	60 0 ..	90 0
5,000 ..	80 0 ..	120 0
6,000 ..	100 0 ..	150 0
7,000 ..	120 0 ..	180 0
8,000 ..	140 0 ..	210 0
9,000 ..	160 0 ..	240 0
10,000 ..	180 0 ..	270 0
12,000 ..	200 0 ..	300 0
14,000 ..	220 0 ..	330 0
16,000 ..	250 0 ..	375 0
18,000 ..	280 0 ..	420 0
20,000 ..	310 0 ..	465 0
25,000 ..	350 0 ..	525 0
30,000 ..	400 0 ..	600 0
35,000 ..	450 0 ..	675 0
40,000 ..	525 0 ..	785 0
45,000 ..	600 0 ..	900 0
50,000 ..	675 0 ..	1,010 0
60,000 ..	750 0 ..	1,125 0
70,000 ..	900 0 ..	1,350 0
80,000 ..	1,050 0 ..	1,575 0
90,000 ..	1,200 0 ..	1,800 0
100,000 ..	1,350 0 ..	2,025 0
120,000 ..	1,500 0 ..	2,250 0

The scale continues to increase up to £1,000,000.

LICENSES.

For Marriage in England (special)	£3	0
Ditto (if not special)	0	10
For Bankers..	30	0
Dealers in Gold	4	0

BONDS, MORTGAGES, &c.

Not exceeding £50 ..					..	£1	0
Above £50 and not above £100					..	1	10
100	..	..		200	..	2	0
200	..	..		300	..	3	0
300	..	..		500	..	4	0
500	..	..		1,000	..	5	0
1,000	..	..		2,000	..	6	0
2,000	..	..		3,000	..	7	0
3,000	..	..		4,000	..	8	0
4,000	..	..		5,000	..	9	0
5,000	..	..		10,000	..	12	0
10,000	..	..		15,000	..	15	0
15,000	..	..		20,000	..	20	0
20,000	..	..		..	..	25	0

RECEIPTS.	s.	d.
For £5 and under £10 ..	0	3
10 .. .. 20 ..	0	6
20 .. .. 50 ..	1	0
50 .. .. 100 ..	1	6
100 .. .. 200 ..	2	6
200 .. .. 300 ..	4	0
300 .. .. 500 ..	5	0
500 .. .. 1,000 ..	7	6
1,000 or upwards ..	10	0

LEASES.		
Where rent under £20 ..	1	0
If £20 and under 100 ..	1	10
100 .. .. 200 ..	2	0
200 .. .. 400 ..	3	0
400 .. .. 600 ..	4	0
600 .. .. 800 ..	5	0
800 .. .. 1,000 ..	6	0
1,000 or upwards ..	10	6

MARINE INSURANCE.	s.	d.
If the premium does not exceed the rate of 10s. per centum on the sum insured	0	3
Not exceeding 20s. per cent. ..	0	6
Not exceeding 30s. per cent. ..	1	0
Not exceeding 40s. per cent. ..	2	0
Not exceeding 50s. per cent. ..	3	0
If exceeding 50s. per centum ..	4	0
Policy for any certain period of time, for every £100, and also for any fractional part of £100—		
Not exceeding 6 calendar months	2	6
Exceeding 6 calendar months ..	4	0

ASSESSED TAXES.

WINDOWS.

No. of Win.	Duty Yearly. £	s.	d.	No. of Windows.	Duty Yearly. £	s.	d.
8	0	16	6	35	11	18	3
9	1	1	0	36	12	6	9
10	1	8	0	37	12	15	3
11	1	16	3	38	13	3	6
12	2	4	9	39	13	12	0
13	2	13	3	40 to 44	14	8	9
14	3	1	9	45 .. 49	15	16	9
15	3	10	0	50 .. 54	17	5	0
16	3	18	6	55 .. 59	18	13	0
17	4	7	0	60 .. 64	19	17	9
18	4	15	3	65 .. 69	20	0	3
19	5	3	9	70 .. 74	22	2	6
20	5	12	3	75 .. 79	23	5	0
21	5	0	6	80 .. 84	24	7	6
22	6	9	0	85 .. 89	25	10	0
23	6	17	6	90 .. 94	26	12	3
24	7	5	9	95 .. 99	27	14	9
25	7	14	3	100 .. 109	29	8	6
26	8	2	9	110 .. 119	31	13	3
27	8	11	0	120 .. 129	33	18	3
28	8	19	6	130 .. 139	36	3	0
29	9	8	0	140 .. 149	38	8	0
30	9	16	3	150 .. 159	40	12	9
31	10	4	9	160 .. 169	42	17	9
32	10	13	3	170 .. 179	45	2	6
33	11	1	6	180 & upwards.	46	11	3
34	11	10	0				

Exemptions.—Charity-schools, hospitals, and poor-houses (excepting the apartments for officers and servants); places for divine worship; dairies and cheese-rooms if made of lath or wire, or of glass, if the room not used to sleep in, and "dairy and cheese-room" is painted over the door. Three windows in the shop or warehouse, if on the basement story. The windows of a room used solely as a manufactory, if not communicating with the dwelling-house, though adjoining thereto. Windows in any farm-house occupied by a tenant at a rack-rent less than £200 per annum; or any farm-house occupied by the owner or tenant of any farm not rack-rent, of which the yearly value shall be under £100 per annum, provided the owner of such farm-house shall not derive any yearly income exceeding £100 from any other source.

PENALTIES UNDER THE STAMP ACT.

For *Attorneys* and *Solicitors* acting without having been admitted, £100.—For acting without certificate, £50.

For drawing a *Bill* or *Promissory Note* upon unstamped paper, £50.—For post-dating *Bills of Exchange*, £100.

For drawing a *Cheque* more than ten miles from the place where made payable, £100.—For receiving the same in payment, £20.—For Bankers paying the same, £100.

For setting out wrong amount in a *Conveyance*, on the attorney, £500. On the purchaser, £50.

For taking possession of effects of any one deceased, without taking *Probate or Administration* within six months, £100.

For giving a *Receipt* upon unstamped paper, if under £100—£10; if above £100—£20. For refusing to give a receipt upon a stamp, £10. For giving a receipt on a stamp too low for the amount thereon specified, £10. For giving the receipt for less than the sum received, £50.

TABLE showing the RATES of PROPERTY and INCOME TAX.

£	£ s. d.	£	£ s. d.	£	£ s. d.	£	£ s. d.	£	£ s. d.
5	0 2 11	200	8 15 0	1,400	40 16 8	2,600	165 0 0	3,800	242 18 4
10	0 5 10	225	9 9 7	1,500	43 15 0	2,700	167 12 6	3,900	247 16 8
15	0 8 9	250	10 4 2	1,600	46 13 4	2,800	170 16 8	4,000	252 15 0
20	0 11 8	275	10 18 9	1,700	49 11 8	2,900	173 15 0	4,100	257 13 4
25	0 14 7	300	11 13 4	1,800	52 10 0	3,000	176 1 4	4,200	262 11 8
50	1 9 2	325	12 7 11	1,900	55 8 4	3,100	179 11 8	4,300	267 10 0
100	2 18 4	350	13 2 6	2,000	58 6 8	3,200	182 10 0	4,400	272 8 4
125	3 12 11	375	13 17 1	2,100	61 5 0	3,300	185 8 4	4,500	277 6 8
150	4 7 6	400	14 11 8	2,200	64 3 4	3,400	188 6 8	4,600	282 5 0
155	4 10 5	450	16 0 10	2,300	67 1 8	3,500	191 5 0	4,700	287 3 4
160	4 12 4	500	17 10 0	2,400	70 0 0	3,600	194 3 4	4,800	292 1 8
165	4 16 3	550	18 19 2	2,500	72 18 4	3,700	197 1 8	4,900	296 18 4
170	4 19 2	600	20 8 4	2,600	75 16 8	3,800	200 0 0	5,000	301 16 8
175	5 2 1	650	21 17 6	2,700	78 15 0	3,900	202 18 4	5,100	306 15 0
180	5 5 0	700	23 6 8	2,800	81 13 4	4,000	205 16 8	5,200	311 13 4
185	5 7 11	750	24 15 10	2,900	84 11 8	4,100	208 15 0	5,300	316 11 8
190	5 10 10	800	26 5 0	3,000	87 10 0	4,200	211 13 4	5,400	321 10 0
195	5 13 9	850	27 14 2	3,100	90 8 4	4,300	214 11 8	5,500	326 8 4
200	5 16 8	1,000	32 3 4	3,200	93 6 8	4,400	217 10 0	5,600	331 6 8
225	6 11 3	1,100	35 1 8	3,300	96 5 0	4,500	220 8 4	5,700	336 5 0
250	7 5 10	1,200	38 0 0	3,400	99 3 4	4,600	223 6 8	5,800	341 3 4
275	8 0 5	1,300	41 18 4	3,500	102 1 8	4,700	226 5 0	5,900	346 1 8
						4,800	229 3 4	6,000	350 18 4
						4,900	232 1 8	6,100	355 16 8
						5,000	236 18 4	6,200	360 15 0
						5,100	241 16 8	6,300	365 13 4
						5,200	246 15 0	6,400	370 11 8
						5,300	251 13 4	6,500	375 10 0
						5,400	256 11 8	6,600	380 8 4
						5,500	261 10 0	6,700	385 6 8
						5,600	266 8 4	6,800	390 5 0
						5,700	271 6 8	6,900	395 3 4
						5,800	276 5 0	7,000	400 1 8
						5,900	281 3 4	7,100	404 18 4
						6,000	286 1 8	7,200	409 16 8
						6,100	290 18 4	7,300	414 15 0
						6,200	295 16 8	7,400	419 13 4
						6,300	300 15 0	7,500	424 11 8
						6,400	305 13 4	7,600	429 10 0
						6,500	310 11 8	7,700	434 8 4
						6,600	315 10 0	7,800	439 6 8
						6,700	320 8 4	7,900	444 5 0
						6,800	325 6 8	8,000	449 3 4
						6,900	330 5 0	8,100	454 1 8
						7,000	335 3 4	8,200	458 18 4
						7,100	340 1 8	8,300	463 16 8
						7,200	344 18 4	8,400	468 15 0
						7,300	349 16 8	8,500	473 13 4
						7,400	354 15 0	8,600	478 11 8
						7,500	359 13 4	8,700	483 10 0
						7,600	364 11 8	8,800	488 8 4
						7,700	369 10 0	8,900	493 6 8
						7,800	374 8 4	9,000	498 5 0
						7,900	379 6 8	9,100	503 3 4
						8,000	384 5 0	9,200	508 1 8
						8,100	389 3 4	9,300	512 18 4
						8,200	394 1 8	9,400	517 16 8
						8,300	398 18 4	9,500	522 15 0
						8,400	403 16 8	9,600	527 13 4
						8,500	408 15 0	9,700	532 11 8
						8,600	413 13 4	9,800	537 10 0
						8,700	418 11 8	9,900	542 8 4
						8,800	423 10 0	10,000	547 6 8
						8,900	428 8 4	10,100	552 5 0
						9,000	433 6 8	10,200	557 3 4
						9,100	438 5 0	10,300	562 1 8
						9,200	443 3 4	10,400	566 18 4
						9,300	448 1 8	10,500	571 16 8
						9,400	452 18 4	10,600	576 15 0
						9,500	457 16 8	10,700	581 13 4
						9,600	462 15 0	10,800	586 11 8
						9,700	467 13 4	10,900	591 10 0
						9,800	472 11 8	11,000	596 8 4
						9,900	477 10 0	11,100	601 6 8
						10,000	482 8 4	11,200	606 5 0
						10,100	487 6 8	11,300	611 3 4
						10,200	492 5 0	11,400	616 1 8
						10,300	497 3 4	11,500	620 18 4
						10,400	502 1 8	11,600	625 16 8
						10,500	506 18 4	11,700	630 15 0
						10,600	511 16 8	11,800	635 13 4
						10,700	516 15 0	11,900	640 11 8
						10,800	521 13 4	12,000	645 10 0
						10,900	526 11 8	12,100	650 8 4
						11,000	531 10 0	12,200	655 6 8
						11,100	536 8 4	12,300	660 5 0
						11,200	541 6 8	12,400	665 3 4
						11,300	546 5 0	12,500	670 1 8
						11,400	551 3 4	12,600	674 18 4
						11,500	556 1 8	12,700	679 16 8
						11,600	560 18 4	12,800	684 15 0
						11,700	565 16 8	12,900	689 13 4
						11,800	570 15 0	13,000	694 11 8
						11,900	575 13 4	13,100	699 10 0
						12,000	580 11 8	13,200	704 8 4
						12,100	585 10 0	13,300	709 6 8
						12,200	590 8 4	13,400	714 5 0
						12,300	595 6 8	13,500	719 3 4
						12,400	600 5 0	13,600	724 1 8
						12,500	605 3 4	13,700	728 18 4
						12,600	610 1 8	13,800	733 16 8
						12,700	614 18 4	13,900	738 15 0
						12,800	619 16 8	14,000	743 13 4
						12,900	624 15 0	14,100	748 11 8
						13,000	629 13 4	14,200	753 10 0
						13,100	634 11 8	14,300	758 8 4
						13,200	639 10 0	14,400	763 6 8
						13,300	644 8 4	14,500	768 5 0
						13,400	649 6 8	14,600	773 3 4
						13,500	654 5 0	14,700	778 1 8
						13,600	659 3 4	14,800	782 18 4
						13,700	664 1 8	14,900	787 16 8
						13,800	668 18 4	15,000	792 15 0
						13,900	673 16 8	15,100	797 13 4
						14,000	678 15 0	15,200	802 11 8
						14,100	683 13 4	15,300	807 10 0
						14,200	688 11 8	15,400	812 8 4
						14,300	693 10 0	15,500	817 6 8
						14,400	698 8 4	15,600	822 5 0
						14,500	703 6 8	15,700	827 3 4
						14,600	708 5 0	15,800	832 1 8
						14,700	713 3 4	15,900	836 18 4
						14,800	718 1 8	16,000	841 16 8
						14,900	722 18 4	16,100	846 15 0
						15,000	727 16 8	16,200	851 13 4
						15,100	732 15 0	16,300	856 11 8
						15,200	737 13 4	16,400	861 10 0
						15,300	742 11 8	16,500	866 8 4
						15,400	747 10 0	16,600	871 6 8
						15,500	752 8 4	16,700	876 5 0
						15,600	757 6 8	16,800	881 3 4
						15,700	762 5 0	16,900	886 1 8
						15,800	767 3 4	17,000	890 18 4
						15,900	772 1 8	17,100	895 16 8
						16,000	776 18 4	17,200	900 15 0
						16,100	781 16 8	17,300	905 13 4
						16,200	786 15 0	17,400	910 11 8
						16,300	791 13 4	17,500	915 10 0
						16,400	796 11 8	17,600	920 8 4
						16,500	801 10 0	17,700	925 6 8
						16,600	806 8 4	17,800	930 5 0
						16,700	811 6 8	17,900	935 3 4
						16,800	816 5 0	18,000	940 1 8
						16,900	821 3 4	18,100	944 18 4
						17,000	826 1 8	18,200	949 16 8
						17,100	830 18 4	18,300	954 15 0
						17,200	835 16 8	18,400	959 13 4
						17,300	840 15 0	18,500	964 11 8
						17,400	845 13 4	18,600	969 10 0
						17,500	850 11 8	18,700	974 8 4
						17,600	855 10 0	18,800	979 6 8
						17,700	860 8 4	18,900	984 5 0
						17,800	865 6 8	19,000	989 3 4
						17,900	870 5 0	19,100	994 1 8
						18,000	875 3 4	19,200	998 18 4
						18,100	880 1 8	19,300	1,003 16 8
						18,200	884 18 4	19,400	1,008 15 0
						18,300	889 16 8	19,500	1,013 13 4
						18,400	894 15 0	19,600	1,018 11 8
						18,500	899 13 4	19,700	1,023 10 0
						18,600	904 11 8	19,800	1,028 8 4
						18,700	909 10 0	19,900	1,033 6 8
						18,800	914 8 4	20,000	1,038 5 0
						18,900	919 6 8		
						19,000	924 5 0		
						19,100	929 3 4		
						19,200	934 1 8		
						19,300	938 18 4		
						19,400	943 16 8		
						19,500	948 15 0		
						19,600	953 13 4		
						19,700	958 11 8		
						19,800	963 10 0		
						19,900	968 8 4		
						20,000	973 6 8		

TABLE of INCOME or WAGES.

Per Yr.		PerMonth.			Per Week.			Per Day.			Per Yr.		PerMonth.			Per Week.			Per Day.		
£	s.	£	s.	d.	£	s.	d.	£	s.	d.	£	s.	£	s.	d.	£	s.	d.	£	s.	d.
1	0	0	1	8	0	0	4½	0	0	0½	14	0	1	3	4	0	5	4½	0	0	9½
1	10	0	2	6	0	0	7	0	0	1	15	0	1	5	0	0	5	9	0	0	10
2	0	0	3	4	0	0	9½	0	0	1½	16	0	1	6	8	0	6	2	0	0	10½
2	2	0	3	6	0	0	9½	0	0	1½	17	0	1	8	4	0	6	6½	0	0	11½
2	10	0	4	2	0	0	11½	0	0	1½	18	0	1	10	0	0	6	11	0	0	11½
3	0	0	5	0	0	1	1½	0	0	2	19	0	1	11	8	0	7	3½	0	1	0½
3	2	0	5	3	0	1	2½	0	0	2	20	0	1	13	4	0	7	8	0	1	1½
3	10	0	5	10	0	1	4½	0	0	2½	30	0	2	10	0	0	11	6	0	1	7½
4	0	0	6	8	0	1	6½	0	0	2½	40	0	3	6	8	0	15	4½	0	2	2½
4	4	0	7	0	0	1	7½	0	0	2½	50	0	4	3	4	0	19	3	0	2	9
4	10	0	7	6	0	1	8½	0	0	3	60	0	5	0	0	1	3	0½	0	3	3½
5	0	0	8	4	0	1	11	0	0	3½	70	0	5	16	8	1	6	11	0	3	10
5	10	0	9	2	0	2	1½	0	0	3½	80	0	6	13	4	1	10	9	0	4	4½
6	0	0	10	0	0	2	3½	0	0	4	90	0	7	10	0	1	14	7½	0	4	11
6	10	0	10	10	0	2	6	0	0	4½	100	0	8	6	8	1	18	5	0	5	5½
7	0	0	11	8	0	2	8½	0	0	4½	200	0	16	13	4	3	16	11	0	10	11½
7	10	0	12	6	0	2	10½	0	0	5	300	0	25	0	0	5	15	4½	0	16	5½
8	0	0	13	4	0	3	1	0	0	5½	400	0	33	6	8	7	13	10	1	1	11
8	10	0	14	2	0	3	3½	0	0	5½	500	0	41	13	4	9	12	3½	1	7	4½
9	0	0	15	0	0	3	5½	0	0	6	600	0	50	0	0	11	10	9	1	12	10½
10	0	0	16	8	0	3	10	0	0	6½	700	0	58	6	8	13	9	2½	1	18	4½
11	0	0	18	4	0	4	3	0	0	7½	800	0	66	13	4	15	7	8½	2	3	10
12	0	1	0	0	0	4	7½	0	0	8	900	0	75	0	0	17	6	1½	2	9	3½
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Name of Mine.	Total Dividend.	Amount of Dividend per Share.	Paid up.	Market Price.
	£	£	£	£
Devon Great Consols	30,720	30	1	230
East Wheal Rose	25,500	200	50	650
Carn Brea	14,000	14	15	100
Par Consols	12,800	100	900	800
Wheal Seton	8,415	85	150	650
North Pool	7,750	77½	45	500
South Francis	5,046	46	160	240
Wheal Margaret	3,136	28	10	200
South Caradon	3,840	30	5	400
United Mines	1,000	10	—	400
Wheal Friendship	2,240	—	—	—
West Caradon	2,460	10	20	130
Bedford United	2,000	¼	2½	3
Treviskey and Barrier..	2,180	26½	130	90
North Roskear..	1,820	13	10	200
Trehane..	1,472	5¾	2	30
Trethellan	1,200	10	20	15
South Basset	1,280	10	—	250
Treleigh Consols	1,000	¼	6½	2
Stray Park	500	⅛	6½	18½
West Providence	409	1⅛	1	15
Wheal Spearne..	256	2	10	—
Total amount of Dividends ..	£ 129,024			

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Communications to be addressed to Mr. W. B. Hays, Engineer to the Proprietors, of whom any further information may be obtained, at their

OFFICE, 31, Parliament Street, Westminster.

WILLIAM WILKINS,

LICENSEE OF

ANDREW SMITH'S PATENT WIRE ROPE,

FOR

MINES, RAILWAYS, BRIDGES, STANDING RIGGING,

&c. &c.

Manufactory, Millwall, Poplar, London.

The attention of the Mining Interests is particularly called to the great advantages of Wire Rope, from its strength, durability, and consequent economy, and the vast saving of power from its lightness, as compared to Hempen Rope and Chain of equal strength.

The subjoined is founded on careful and repeated Tests, made by order of the Lords Commissioners of the Admiralty, and shows the comparative difference between Patent Wire Rope, Hempen Rope, and Chain, as regards size, strength, weight, and price.

PRICE OF WIRE ROPE, 56*s.* per Cwt.
If Galvanized, 66*s.* per Cwt.

Wire Rope.		Hempen Rope.		Chain.		Breaking Strain.	Working Load.	Price ℔ Yard, Ungalvanized, about	Price ℔ Yard, Galvanized, about
Size Ungalvzd.	Weight ℔ Yard.	Size.	Weight ℔ Yard.	Size.	Weight ℔ Yard.				
In.	lb. oz.	In.	lb. oz.	In.	lb. oz.	Tons. Cwt.	Cwt.	*s. d.*	*s. d.*
1½	1 0	3	1 10	5/16	2 8	2 5	8	0 6	0 7
1¾	1 3	4	2 4	⅜	4 8	4 6	13	0 7	0 8½
2	1 11	5	3 1	½	8 0	6 7	18	0 10	1 0
2½	2 12	6	4 8	⅝	11 0	8 11	30	1 4½	1 7
3	3 11	7	6 0	¾	15 0	11 14	45	1 10	2 1½
3½	5 2	8	7 0	⅞	20 8	15 6	60	2 6½	2 11¼
4	6 12	9	9 8	1	27 0	19 6	73	3 4½	3 11
4½	8 12	10	12 8	1⅛	34 0	24 8	84	4 4½	5 1½
5	11 0	11	15 8	1¼	42 0	32 5	99	5 6	6 5½

PRICE OF FLAT WIRE ROPE, 68*s.* per Cwt.
If Galvanized, 80*s.* per Cwt.

Hemp.		Wire.			
Size Inches.	lbs. Weight ℔ Yard.	Size Inches.	lbs. Weight ℔ Yard.	Breaking Strain.	Working Load.
				Tons.	Cwt.
3½ × 2	6	2½ × 7/16	4 8	12	20
4 „ 1	8	—	—	—	—
4½ „ 1½	10	3 „ ½	6 0	20	40
		3½ „ 7/16	6 0	20	40
5 „ 1½	12	3½ „ 9/16	6 8	24	48
5½ „ 1⅝	13	4 „ ½	8 1	30	58
6 „ 1¾	14	4 „ ⅝	11 10	34	66
7 „ 1⅞	18	4½ „ 9/16	12 0	40	80

LIGHTNING CONDUCTORS,
For protecting Ships, Churches, Chimneys, Shafts, and all other Buildings from Lightning—

1¼ - 1⅝ - 1½ Inches circumference.
8*d.* - 10*d.* - 1*s.* per Foot.

IRON SASH LINE	⅜	½	⅝	¾	1 Inch	℔ Yard.
	2*d.*	3*d.*	4*d.*	5*d.*	6*d.*	
COPPER Ditto	4*d.*	5*d.*	7*d.*	10*d.*	15*d.*	ditto.

STRAND FOR FENCING, SIGNAL-CORD FOR RAILWAYS, PITS, &c. 55*s.* Ungalvanized, and 66*s.* & 70*s.* Galvanized (according to size) per Cwt.

TERMS.—Bill at 4 months, or 2½ per cent. discount for cash.

Galvanized Ropes are preferable to ungalvanized Ropes under circumstances where they would not be in constant use, and are exposed to damp or frequent alternations of wet and dry, but ungalvanized Ropes are more desirable for general purposes, where they would be in constant use, being not only much cheaper but are also stronger and lighter, as the process of galvanizing increases the size and weight without adding strength.

Caution.—In applying Wire Ropes to Mining and Railway purposes, care should be taken that they are not worked round drums or over sheaves or pulleys (at *prows* or *angles* of whatever degree) of insufficient circumference.

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PATENTEE OF THE

IMPROVED GALVANIZED IRON & WIRE ROPE.

MANUFACTORY—MILLWALL, POPLAR.

Prices of the under-mentioned Articles in London:—

BEST SHEET IRON.

This Price includes the Iron.

Gauge.	Cwt.
26	
25	
24	30s.
23	
22	
21	
20	25s.
19	
18	
17	20s.
16	

WIRE.

This Price does not include the Wire.

Gauge.	Cwt.
1	
2	
3	10s.
4	
5	
6	
7	12s.
8	
9	
10	
11	14s.
12	
13	
14	
15	16s.
16	

CHAIN.

This Price does not include the Chain.

Size.		
¼	20s.	0d.
5/16	17	0
⅜	14	6
7/16	12	6
½	11	0
9/16	10	0
⅝	9	6
¾	9	0
1	8	6
1¼	8	0
1½	7	6
1¾	7	0

Bolts, Plates, and Iron-work of every description Galvanized, in the same proportion.

Discount to the Trade.

FOURDRINIER'S

PATENT SAFETY APPARATUS,

FOR THE

Preventing Accidents in Mines

AND OTHER PLACES, WHEN THE ROPE OR CHAIN BREAKS.

By the ADOPTION of this INVENTION the LIVES of the WORKING MINERS may be PRESERVED, and the PROPERTY of the MINE OWNERS PROTECTED from the serious consequences of either of the following accidents: viz.—

1. From the men, or the load, being precipitated to the bottom of the shaft when the rope or chain breaks; in this case the apparatus is Self-Acting. 2. From either the men, or load, being drawn over the pulley; in this case, also, the apparatus is Self-Acting. 3. From the fearful consequences to men, or load, of a "whirl," or run: in this case the result is equally certain.

A Coal Pit, with the Safety Apparatus attached to the Cage, is daily at work near Burslem, in the Staffordshire Potteries.

To Inspect the Apparatus, or to obtain any further information, application may be made to Mr. EDWARD N. FOURDRINIER (the Patentee), Cheddleton, near Leek, Staffordshire; or to Mr. JOSEPH FOURDRINIER, 68, Arlington Street, Camden Town, London—who are prepared to Grant Licenses for the Sale of the Patent.

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TO RAILWAY COMPANIES.

This BRIDGE has now been for 18 months in DAILY USE (having a double track) on the HARLEM RAILWAY, in the State of New York, United States. The Erie Railway and the Newhaven Railway Companies have likewise adopted it.

Several other bridges, for ordinary purposes, are also being constructed.

The advantages of this over all other iron bridges hitherto invented, consist in the small amount of iron required compared with the strength obtained, in avoiding the use of any surplus weight of material, in the consequent economy of its construction, and also from its lightness, easy mode of putting together, and facility of transport, in its peculiar adaptation for foreign use.

As regards economy, it can be erected at a Cost not exceeding that of a WOODEN BRIDGE of equal capability.

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FOR MARINE AND LOCOMOTIVE

STEAM-BOILERS,

TUBES FOR STEAM, GAS, AND OTHER PURPOSES,
ALL SORTS OF GAS-FITTINGS.

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AND

SMETHWICK, STAFFORDSHIRE,

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WORKS—SMETHWICK, STAFFORDSHIRE.
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STRONG MIXING PIG-IRON.

THE YSTALYFERA IRON COMPANY

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ANTHRACITE PIG-IRON.

This Iron mixes well with Scotch Pig—imparting to it strength and elasticity, and receiving from it a portion of its softness and fluidity. No. 3 Pig is recommended for mixing with Soft Iron—Nos. 1 and 2 for machinery castings, requiring great soundness and strength.

At this period, when cast-iron is so much employed in the construction of bridges and other buildings, requiring all the strength and elasticity which the best mixture of metal will afford, it may be interesting to call attention to the characteristics of ANTHRACITE PIG-IRON, as reported on by that great practical authority, the late David Mushet, Esq., M.I.C.E.

"It greatly exceeds in *strength*, in *deflective* powers, and capacity to resist *impact*, any Iron at this time manufactured in the United Kingdom."

"It now only remains for me to mention a property peculiar to this Iron, which was noticed at the time I made the trial experiments, four years ago, but which has been more fully developed in those more recently made. The property referred to is one of *great springiness* or *elasticity*, which communicates a tendency to the bar, in deflecting and breaking, to resume its rectangular form. Bars that had obtained a permanent set of 2-10ths, when afterwards broken, presented but a slight deviation from a right line; and in no case did the curvature exceed one-fourth of a tenth."

"It was also remarked, that most of the fractures, in breaking, presented a *regularity of grain* throughout, resembling the structure of *unhardened steel*."

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Dated June 22, 1847.

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By Her Majesty's Royal Letters Patent.

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Also Patented for the COLONIES, HOLLAND, FRANCE, and the UNITED STATES of AMERICA.

J. GLADSTONE, JUN., & Co., Iron-Founders, Ship and Anchor-Smiths, &c., most respectfully beg to call attention to their Unique Improved PATENT WINDLASS PURCHASE, which for Simplicity, Power, Speed, and General Utility, stands Unrivalled; in proof of which they have much pleasure in stating that it has been approved of by the Lords of the Admiralty, and fitted on board Her Majesty's Royal Yacht "Victoria and Albert;" also the Boston and Halifax Royal Mail Packets, the Oriental and Peninsular Steam Packets, the Russian and Prussian Steam Frigates, and numerous Merchant Ships of various tonnage, which in every instance has given the most entire satisfaction.

J. G., Jun., & Co., beg also to state that they are Manufacturers of Cambooses, Iron Knees, Pumps, Crab-Winches, Stoves, Patent and Common, Double and Single Screw-Jacks of every description.

All orders will meet prompt attention from J. GLADSTONE, Jun., & Co., Iron-Founders, Chain-Cable and Anchor Manufacturers, 76 and 78, Sparling-street, Liverpool.

IMPORTANT TO RAILWAY AND STEAM NAVIGATION COMPANIES, MANUFACTURERS, AND ENGINEERS.

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PATENT LUBRICATING FLUID (or Animal Oil)

FOR ALL DESCRIPTIONS OF MACHINERY.

W. B. & Co. have the pleasure to state that the above article is extensively used in Her Majesty's Steam Navy, and by several of the principal Steam Navigation and Railway Companies, and is pronounced by them, and by the first practical engineers of the day, to be far better adapted for the purposes of lubrication than any other article hitherto used for such purposes. The Patent Lubricating Fluid is equally applicable for the most intricate and finest pieces of machinery, as for the heaviest bearings of the steam-engine. It is cheaper, much more economical, and cleaner than oils at present in use; is free from smell, and calculated to effect a vast saving in the expenditure of working steam powers.

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N.B.—The above article will burn in lamps, and give a light equal to the best Sperm Oil.

COMBINED VAPOUR ENGINE.

This INVENTION is applied either to a single engine, with two cylinders and pistons, or, as is usual for marine purposes, two distinct engines with a cylinder and piston each. One of the pistons is acted upon by steam, and the other by the vapour of Perchloride, or of any other easily vapourized liquid.

The steam is generated and applied as in the ordinary engine; but upon its escape from the first cylinder, after having exerted its expansive force therein, it passes into a case, termed a vapourizer, containing a number of small tubes charged with Perchloride, or some easily vapourized liquid, penetrates into the space between, and thus comes into contact with the entire surface of the tubes.

Immediately upon the steam coming in contact with the surface of the tubes so charged, a large portion of its caloric is absorbed by the liquid, which is thereby vapourized; and the steam, being deprived of its caloric, becomes immediately condensed, and is then returned into the steam-boiler, or, being by this process perfectly distilled, may be applied for culinary or any other purposes for which pure water is required.

The vapour obtained, by the action of the steam upon the liquid in the tubes, is conducted into the second cylinder; and, after exerting its elastic force (which is greater than that of steam) upon the piston, is condensed, and, by means of a force-pump, returned into the vapourizer, which it thus keeps regularly supplied, and is alternately vapourized and condensed.

Cards of admission, to view the working of the Engine, may be obtained by application to

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The PROPRIETORS of IRON FORGES and MILLS are respectfully invited to make Trial of Mr. BLEWITT'S REFINED IRON, or METAL, PREPARED by a

NEW PATENT PROCESS,

Whereby the Iron is completely freed from the Impurities contracted in the Blast-Furnace, and, by judicious mixtures, rendered applicable to every kind of Manufacture. Heretofore, the Metal usually sold in the Market has been produced from the worst pigs, scraps, and refuse of some particular blast-furnace, or set of furnaces, without any mixture, or any regard to quality, or the purpose for which it might be required.

The PATENT METAL is PREPARED ON SYSTEM, and TO ORDER, for any of the following purposes:

1. For BOILER and TANK-PLATES.
2. For TIN-PLATES, commonly called COKE-PLATES.
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The PATENT METAL is marked with a Squirrel, and the initials "R. J. B.," and is to be had only at the

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Capital—£20,000, in 2,000 shares, of £10 each.

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This INSTRUMENT has now been Successfully Employed by many Eminent Engineers, to whom Reference can be given.

For Particulars, apply either to the Inventor, B. Biram, Esq., Wentworth, near Rotherham; or to the Maker, John Davis, Derby, Manufacturer of Miners' Dials, Clinometers, Safety Lamps, and all kinds of Instruments appertaining to the Engineer, are made and kept in stock. —Repairs promptly attended to. J. DAVIS, Irongate, Derby.

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This article affords the SAFEST, CHEAPEST, and most EXPEDITIOUS MODE of effecting this very hazardous operation.

From many testimonies to its usefulness with which the Manufacturers have been favoured from every part of the kingdom, they select the following letter recently received from John Taylor, Esq., F.R.S., &c. :—

"I am very glad to hear that my recommendations have been of any service to you; they have been given from a thorough conviction of the great usefulness of the Safety Fuse, and I am quite willing that you should employ my name as evidence of this."

Manufactured and sold by the Patentees, BICKFORD, SMITH, & DAVEY, Camborne, Cornwall.

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Plans and Sections of Underground Workings, Drawings of, and Estimates for, every kind of Machinery, Reports on Mines and Mineral Estates, with lithographic illustrated details, Prospectuses for new Companies, carefully drawn up, and every assistance rendered necessary to Mining Enterprise—charge most moderate. Mr. C. S. R. further wishes to inform his friends, that he is prepared to undertake the Entire Working of any Mine by Contract, according to a plan given, on due security of payment being entered into by the employers.

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For Roofs, Sheds, Sheathing for Ships, Standing Rigging, &c., Belts, Rings, Nails, Screws, Wire (all sizes); also for Agricultural Implements and Household Utensils. Apply at the Office of the Galvanized Iron Company, 3, Mansion-house-place, for Specimens and full Particulars.

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Persons assuring on the bonus system will be annually entitled to 80 per cent. of the profits of this branch (after payment of five yearly premiums); and the profit assigned to each policy may be added to the sum assured, or applied in reduction of the annual premium.

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The tables on the non-participating principle afford peculiar advantages to the assured, not offered by any other office; for, where the object is the least possible outlay, the payment of a given sum is secured to the policy-holder, on the death of the assured, at a reduced rate of premium.

Premiums to Assure £100.			Whole Term.	
Age.	One year.	Seven years.	With Profits.	Without Profits.
20	£0 17 8	£0 19 1	£1 15 10	£1 11 10
30	1 1 8	1 2 7	2 5 5	2 0 7
40	1 5 0	1 6 9	3 0 7	2 14 10
50	1 14 1	1 19 10	4 6 8	4 0 11
60	3 2 4	3 17 0	6 12 9	6 0 10

One-half of the whole term premium may remain on credit for seven years, or one-third of the premium may remain for life as a debt upon the policy at 5 per cent., or may be paid off at any time without notice.

Claims paid in one month after proofs have been approved.

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Credit given for Half the Premiums during the whole of life.

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*** The Board meets every FRIDAY at Two o'clock.
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CENTRALISING ALL MATTERS WHICH THE PROFESSION REQUIRE NEGOTIATED,

IN UNION WITH

THE SOLICITORS' REGISTER,

A STAMPED WEEKLY PUBLICATION, ESTABLISHED IN 1840.

Office, 6, Carey Street, Lincoln's Inn, London.

The gratuitous distribution of the first extraordinary number of the SOLICITORS' REGISTER *was* 12,000 *on Wednesday, the 24th January,* 1849. *The second extraordinary number for gratuitous distribution it is proposed to publish the first Wednesday in May: Advertisements in time on Wednesday, the 25th April.*

The *Solicitors' Register* is peculiarly a MONETARY Journal, through which some of the largest money transactions have been effected, and is now in union with the METROPOLITAN, PROVINCIAL, AND COLONIAL LAW AGENCY OFFICE, the Departments of which are—1. Negotiating Loans on all descriptions of Property (particularly Mining Property), through the medium of a widely extended connection among Solicitors and Capitalists. 2. The Sale or Purchase of Partnerships or Practices. 3. Negotiating Clerkships. 4. Applying for Letters Patent of Inventions. 5. Literary Agency and Advertisements.

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The above Agency Office was established in 1846, and is under the direction of a Gentleman who was for 14 years publicly connected with the Profession, previous to the founding of the Office, and its union with the *Solicitors' Register*. The Office and Paper have been recently made known to the entire Legal Profession in the United Kingdom—*first*, by a letter addressed to upwards of 10,000 Solicitors; *secondly*, by a communication which must have come under the notice of at least 30,000 Clerks; and *thirdly*, by a judicious distribution in various parts of the country of about 20,000 placards.

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The increasing prosperity of the Society has enabled the Directors, at the Annual Meeting, held on the 10th May, 1848, to declare a Fifth Bonus, varying from 27 to 65 per cent. on the Premiums paid on each Policy effected on the profit scale.

EXAMPLES.

Age.	Sum Assured.	Annual Premium.	Policy taken out in	Bonus in addition to Sum Assured	Bonus in Cash.	Permanent Reduction of Annual Premium.	Sum the Assured may borrow on Policy.
				£ s. d.	£ s. d.	£ s. d.	£ s. d.
60	£ 1,000	£ s. d. 74 3 4	1837	262 14 3	121 15 11	20 0 0	543 17 9
			1838	237 15 6	108 16 4	17 7 6	494 8 10
			1839	211 18 6	95 16 9	14 17 7	445 0 0
			1840	163 8 4	75 15 0	11 10 9	395 11 1
			1841	159 3 4	71 5 0	10 19 8	346 2 3
			1842	132 2 6	58 17 6	8 19 10	296 13 4
			1843	84 11 8	37 10 0	5 14 2	247 4 5

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The Annual Report, with Tables of Rates, &c., may be had at the Office, or any of its branches in the country; or on application, will be forwarded post free.

W. S. B. WOOLHOUSE, Actuary.

IRON, HARDWARE, AND METAL TRADES' PENSION SOCIETY.

ESTABLISHED MARCH 24, 1843.

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The SIXTH ELECTION of PENSIONERS of the above Society will take place in the month of May next. The Candidates must be deserving and necessitous persons, occupying or having occupied, the station of Master, Traveller, Clerk, Warehouseman, Foreman, or Apprentice, in any branch of the IRON, HARDWARE, or METAL TRADES, in any part of Great Britain, or the Widows of such persons. The printed Forms of Application may be had of the undersigned, to whom they are to be returned filled up with the required particulars, on or before the 5th day of February next, after which day no application relating to this election can be received.

Further information may be obtained from any member of the Committee in Town or Country; or from

THOMAS HAWKINS, Honorary Secretary,
4th December, 1848. 67, Upper Thames Street, London.

N.B.—At the Fifth Election, which took place at the London Tavern, on the 27th November, the following were added to the recipients of 20 Guineas annually:—

William Williams, of Birmingham.
Thomas Fennel, of Lambeth.
William Seager, of Spitalfields.
Annie Horton, of Handsworth, Birmingham.
Elizabeth Frith, of Hatton Garden.

Total number of Annuitants—Nineteen.

PRINTERS' PENSION SOCIETY.

THIS Society is established for the RELIEF of AGED and INFIRM PRINTERS and their WIDOWS, by granting to the former small Pensions of £12. 12s. a year each, and to the latter, £8. 8s. The

SUBSCRIPTION only 5s. a year, or

LIFE SUBSCRIPTIONS, £2. 2s. and upwards.

All classes of Society are more or less interested in the Art of Printing, for business could not be carried on without its aid; the discoveries of science could not be promulgated without it; and it contributes in a most important degree to the comfort, improvement, and general intellectual advancement of the World. Therefore it is that the Committee of this Society venture to solicit the support of the Public at large in furtherance of its object.

Patron.

HIS ROYAL HIGHNESS PRINCE ALBERT.

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ADDRESS.

No country in the world is so highly distinguished for a widely-spread philanthropy as England. This spirit has for ages been the beacon which has lighted to her shores the distressed of all countries; where they have met with that prompt and humane assistance which has endeared her institutions to all classes of individuals, and carried the fame of her benevolence to the remoteat parts of the earth. Of late years this spirit has taken so much deeper root, and so much more widely spread its branches, that with truth it may be said the whole country has become one vast forest of charitable institutions. But, until recently, this scene, so resplendent with all that makes us great as a nation—so replete with all that makes us beloved as philanthropists, had yet one point unillumined:—one class of individuals seemed to have been overlooked—a class, too, the pivot upon which all others move—the very axis, in fact, upon which the great world of charity revolves—the Printer—through whose instrumentality life and light have been imparted to all the charitable institutions of which this or any other country can boast; causing the sun of prosperity to warm and gladden the noble institutions of our land, not in one way only, but by every means—up to the supply of that Holy Book which reveals the "Father of Mercies," and unfolds the Charter of Man's Immortality. Through the labours of the Printer the ignorant have acquired knowledge, the senator wisdom, and the monarch grace to rule in righteousness; he it is who, instrumentally, supplies all the wants of the moral world, and causes "the widow's heart to sing for joy;" who conveys the tale of misery from the poor man's cot to the abodes of affluence and royalty, and makes even the sigh of distress to be heard from the remotest corners of the earth.

From the very nature of his occupation, the condition of the Printer is comparatively unknown to the community at large, immured as he is in a close and confined place of business from an early to a late hour, and not unfrequently throughout the night. Independently of the confinement which

his employment necessarily entails upon him, he is subjected to various complaints almost inseparable from the nature of his occupation. The minerals of which the types are composed not unfrequently exert a pernicious influence upon him; besides which, in the process of correcting, he is in a position which materially tends, ultimately if not immediately, to disturb the harmony of the internal organs. The variety of temperatures to which he is subjected, arising sometimes from hot air, sometimes from steam, and sometimes from gas—to the effects of which he is peculiarly susceptible from the inactive nature of his habits—also, not unfrequently, lays the foundation of chronic diseases. But the most serious of all the calamities to which he is subject is loss of sight. It is no uncommon circumstance for a member of the art of printing to become blind, or his sight so much impaired as to be of little service to him,—though naturally, perhaps, blest with the nicest discrimination of which this sense is capable. Frequently, before he arrives at the age of manhood, his sight, instead of strengthening, becomes weaker; before he arrives at the middle period of man's allotted term he is obliged to seek aid from artificial means; and, should he yet further advance beyond this period of life, he is overtaken by a complication of maladies, which never leave him until the sigh of the sufferer is hushed in the grave.

For all the ordinary "ills to which flesh is heir," it has been said *personal* provision should be made:—the season of age and decay should be anticipated in that of youth and strength. This, in the abstract, is true; but those best acquainted with the subject know that, with a few exceptions, no trade or profession is more liable to fluctuation than the Press; and that if, during the parliamentary session and the season for fashionable publication, the Printer is enabled to make some provision for the period when his services are less in request—when the senator seeks relaxation and the fashionable world a genial atmosphere,—it is as much as ordinarily he can effect. Further than which, it should be borne in mind, that to be eligible for the Printers' Pension a man must have subscribed *seven years*: and that, at the elections, a proper discrimination is usually made between the candidate who has limited his subscriptions to the mere term of *eligibility* and he who has, without *immediate* reference to self, aided the funds of the Institution for a longer series of years. The PRINTERS' PENSION SOCIETY does not, therefore, as it has been affirmed, offer "*a premium on improvidence.*"

Under all the circumstances of the case, can it then be deemed intrusive that an appeal should be made to that public, towards whose improvement, comforts, and luxuries, the Printer has so largely contributed, to administer somewhat of its abundance in aiding the Funds of this Institution for his support when poverty and the infirmities of age overtake him? Surely, such an appeal will not be made in vain! No rightly-formed mind will, it is confidently anticipated, like the priest and the Levite, "pass by on the other side;" but will rather, in imitation of the conduct of the good Samaritan, bear the misfortunes of the poor Printer at his own cost; and yet further, in humble imitation of the blessed Saviour of Mankind, exhort others to—"*go and do likewise!*"

Fifty Pensioners are now on the Funds.

*** Donations and Subscriptions will be thankfully received by the Treasurer, R. TAYLOR, Esq., Red Lion Court, Fleet Street; Bankers, Messrs. DIXON & Co., Chancery Lane; by the Secretary, Mr. J. S. HODSON, 2, Clifford's Inn Passage, Fleet Street; and by the Collector, Mr. T. BILLING, 11, Great Distaff Lane, Cheapside.

PROFESSIONAL LIFE ASSURANCE COMPANY,

CONNECTING THE

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HOLDING OUT ADVANTAGES TO THE PUBLIC NOT HITHERTO OFFERED BY ANY SIMILAR INSTITUTION.

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Rates essentially moderate.—Every description of policy granted. Immediate, survivorship, and deferred annuities; and endowments to widows, children, and others.—Every policy (except only in cases of personation) indisputable.—The assured permitted to go to and reside in Canada, Nova Scotia, New Brunswick, Australasia, Madeira, Cape of Good Hope, and Prince Edward's Island, without additional premium.—Medical men remunerated for their reports.—Loans granted on real or personal security.—One-tenth of the entire profits appropriated for the relief of the assured while living, and of his widow and orphans.—Annuities granted in the event of blindness, insanity, paralysis, accidents, and any other bodily or mental affliction disabling the parties.—Persons of every class and degree admitted to all the advantages of the corporation.—Rates for assuring £100 at the age of 25, 35, 45, and 55, respectively,—namely, £1. 14*s.* 6*d.*, £2. 5*s.* 6*d.*, £3. 4*s.* 3*d.*, and £4. 18*s.* 6*d.*

Prospectuses, with full details, may be had at the Office.—Applications requested from parties desirous of becoming agents.

EDWARD BAYLIS, Actuary and Secretary.

OFFICES, 76, CHEAPSIDE, LONDON.

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(PROVISIONALLY REGISTERED.)

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IMPORTANT TO MINE OWNERS, &c.

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CITY ROAD, LONDON.

The GUTTA PERCHA COMPANY beg to bring under the Notice of Mine Owners, Manufacturers, &c., the Great Saving, both of Time and Expense, which is effected by the use of the

Gutta Percha Pump Buckets and Valves.

These Buckets may be had of any size or thickness, without any seam or raised joint. They are unaffected by acids, alkalies, &c. Cold water will never soften them, and they are, consequently, much more durable than leather, and also cheaper. The most gratifying Testimonials have been received from Millowners, who have had these Buckets in operation for several months past without the slightest repairs being required.

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Being so remarkable a CONDUCTOR of SOUND, is now being extensively applied for CONVEYING MESSAGES from one Building or Place to another. If a Tubing of this material, one inch in diameter, be carried from the mouth of a mine or pit down the shaft, to various parts of the mine (no matter whether a quarter or half a mile distant), an instant communication may be established by means of the whistle on Wishaw's principle, and a conversation carried on as distinctly as though the parties were but a few feet from each other. When these Tubes are in general use, they will greatly lessen the loss of life in mines.

Gutta Percha Driving Bands

Continue to secure a continually increasing demand; they can be had of any size or length. Their durability and strength, permanent contractility and uniformity of substance, their non-susceptibility of injury from contact with oils, grease, acids, alkalies, or water, and the facility with which the only joint required can be made in bands of from 200 to 300 feet long, render them superior for almost all working purposes, and decidedly economical.

GUTTA PERCHA Soles for Boots and Shoes, Bowls, Buckets, Picture Frames, Brackets, Mouldings, Surgical Instruments, Vases, Cups, Inkstands, Balls, &c., may be had at the Company's Works, Wharf Road, City Road, London, or of any of their wholesale Dealers in town or country.

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This Paint is the Product of a Patent Process, and possesses Peculiar and Valuable Properties, not otherwise attainable.

Its colour (as at present produced) is a rich *purple-brown*. It is perfectly free from the deleterious qualities of white lead.

It surpasses all other paints ever yet discovered, in point of *durability* and *economy*.

Two coats of this paint are more than equal to three of any other description.

From its chemical composition, it is pre-eminently adapted for covering *iron*; also *wood*, and *stuccoed*, or *brick buildings*. The process by which the base of this paint is produced, makes it impossible that any change should take place in its composition from atmospheric influence. Its identity with iron secures it from galvanic action, so fatal to the durability of lead and other paints on iron-work.

It has been exposed on shipping to the action of sea-water, and of the sulphuretted hydrogen, so prevalent in seaports and tidal harbours, for more than three years, without change.

Its *cheapness* and *strength* render it peculiarly suitable for *iron bridges*, *roofs*, and *railways*, *farm buildings*, and *shipping*. It will also cover creosoted timber.

Price by the Ton, £25.

Delivered in London, exclusive of packages.

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JOHN A. WEST, Secretary.

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ASPHALTE OF SEYSSEL

renders it the most perfect PAVEMENT or COVERING that can be relied upon for hermetically closing, and thereby preventing the rising of moisture and escape of noxious vapours. The present extensive application of this material for covering roofs, terraces, and arches, for preventing the percolation of wet, is strong evidence of its effectiveness for the above purposes, which is further confirmed by the following extract from the Report of the Commissioners on the Fine Arts :—

"In 1839, I superintended the construction of a house of three stories on the Lac d'Enghein. The foundation of the building is constantly in water, about 19½ inches below the level of the ground floor. The entire horizontal surface of the external and internal walls was covered at the level of the internal ground-floor with a layer of SEYSSEL ASPHALTE,* less than half an inch thick, over which coarse sand was spread.

"Since the above date, no trace of damp has shown itself round the walls of the lower story, which are for the most part painted in oil, of a grey stone colour. It is well known that the least moisture produces round spots, darker or lighter, on walls so painted. Yet the pavement of the floor, resting on the soil itself, is only about 2½ in. above the external surface of the soil, and only 19½ in., at the utmost, above that of the sheet of water.

"The layer of Asphalte having been broken and removed, for the purpose of inserting the sills of two doors, spots indicating the presence of damp have been since remarked at the base of the doorposts."

I. FARRELL, Secretary.

Seyssel Asphalte Company, Stangate, London.

* This method has been adopted at the new Houses of Parliament.

PLANTAGENET GUARD RAZOR.

By Royal Letters Patent.

UNDER THE ESPECIAL PATRONAGE OF

The NOBILITY and GENTRY, the ARMY and NAVY, the CLERGY, the BAR, and the FACULTY.

This Guard Razor is made of the finest tempered steel, imparting a matchless smoothness and keenness to the edge; and the addition of the moveable Guard causes the Razor to glide with safety over the face, ***removing the beard without cutting the skin.***

Every Razor is warranted, and will be exchanged if imperfect.

Printed descriptive particulars sent post free.

Prices :—Best Ivory Handles, per pair, 16*s.*; Black ditto, 12*s.*; sent post free for 8*d.* each extra. A pair with Ivory Handles in Russia Box, One Guinea; post free, 1*s.* 6*d.* extra. A single Razor, with splendid electro-gilt Guard in Roan Case, Half-a-Guinea.

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(Removed from 140, Strand, to)

22, CHARING CROSS.

CAUTION.—Every Guard is stamped with the Patentees' signature of "C. STEWART and CO.," to imitate which is forgery.

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"Among the most valuable discoveries of modern times."—*Morning Post.*

"We have great pleasure in recommending it."—*Observer.*

"Every possibility of cutting the skin is avoided, while the perfect removal of the hair is secured."—*Sunday Times.*

"This guarded razor is really a splendid invention." *Lancet.*

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"An admirably contrived and wonderfully safe instrument—a perfect paragon of a shaving tool."—*John Bull.*

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"A perfect skin preserver."—*Douglas Jerrold.*

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"A man may safely shave with such a razor in all weathers."—*Times.*

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E. J. DENT, 82, STRAND, and 33, COCKSPUR STREET,

Watch and Clock Maker, BY APPOINTMENT, to the Queen and his Royal Highness Prince Albert,

Begs to acquaint the Public, that the Manufacture of his Chronometers, Watches, and Clocks, is secured by three separate Patents, respectively granted in 1836, 1840, 1842. Silver Lever Watches, jewelled in four holes, 6 gs. each; in gold cases, from £8 to £10 extra. Gold Horizontal Watches, with gold dials, from 8 gs. to 12 gs. each.

DENT'S PATENT DIPLIEDOSCOPE, or Meridian Instrument, is now ready for delivery. Pamphlets containing a description and directions for its use, 1*s.* each, but to customers gratis.

NOTICE
TO RAILWAY AND STEAM-BOAT TRAVELLERS.

ANDERTON'S HOTEL,
162, 164, & 165, FLEET STREET, LONDON.

ESTABLISHED UPWARDS OF 200 YEARS.

F. CLEMOW begs to acquaint Gentlemen, Families, and the Public in general visiting London, that the above-named Hotel is situate in the centre of London, with communication every five minutes to and from all the Railways and Steam-Boats; near the Theatres, Law Courts, Bank, Docks, &c.

The LARDER and WINE arrangements are equal to the best Clubs in London. The Bill of Fare contains every delicacy.

DINNERS from Twelve to Eight o'clock—From the Joint, with Vegetables, &c., 1s. 6d.; ditto, with Soup or Fish, 2s. Game, Poultry, &c.

BREAKFAST, with Joint, 1s. 6d. BEDS, 10s. 6d. per week.

Servants charged in bill.

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A Night Porter always in attendance.

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Will find this Hotel, being situated in the most central part of the city of London, replete with every convenience and comfort, combined with moderate charges. The Bedrooms are very airy and quietly situated.

WINES, SPIRITS, AND MALT LIQUORS OF THE FIRST QUALITY.

To his Mining Friends in Cornwall, Devon, and Wales, J. INNES takes this opportunity of thanking them for the patronage and support he has received during the past Twenty-five Years, and solicits a continuation of their favours.

ROOMS FOR MEETINGS OF MINING COMPANIES, ARBITRATIONS, &c.

May at all times be secured, with every accommodation that may be required, so as to afford the convenience of meeting in a central position of the city of London, at the same time that, while facilities are afforded for conducting the proceedings, privacy is secured, so as to render those advantages to adventurers in the town and country which could only otherwise be obtained by the heavy expenses attendant on private offices.

Agents and Parties connected with some of the principal Mines in Cornwall and Devon may be daily consulted, while it will be J. Innes's object at all times to promote the interest and comfort of those who may favour him with their patronage and support.